Library Research for Energy, Minerals, and Uranium Resources

August 27, 2020

Emily C. Wild, Chemistry, Geosciences and Environmental Studies Librarian

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“If you can’t grow it, you mine it”
My GPO FDLP Webinars

Upcoming webinars
Nov/Dec 2020 : From the Rocks to the Stocks - Library Research with a Geosciences Librarian and a Finance Librarian
November 2020 : Using Art Sources for Chemistry, Geosciences, and Environmental Studies Library Research
October 2020 : Library Research for Natural Hazard Events: Earthquakes, Hurricanes, Volcanoes, and Wildfires

Past webinars, Princeton University
July 2020 : Library Research for Atmospheric and Oceanic Sciences (Including Climate Change) https://www.fdlp.gov/library-research-for-atmospheric-and-oceanic-sciences-including-climate-change
March 2020: Library Research for Water Resources https://www.fdlp.gov/library-research-for-water-resources

Past webinars, U.S. Geological Survey (USGS)
USGS Library Materials for Water Resources Information https://www.fdlp.gov/usgs-library-materials-for-water-resources-information
USGS Library Materials for Earth’s Age https://www.fdlp.gov/usgs-library-materials-for-earth-s-age
Energy & Minerals - Who do I help?  

"Princeton in the nation’s service and the service of humanity"

When working at the U.S. Geological Survey
- 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

When working at Princeton University
- 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
Quick Bio

Emily C. Wild
Lewis Science Library, Princeton University
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Schedule a Research Consultation: Monday – Friday

Meet Our Specialists – Emily Wild

- Princeton University Library, 2018-Present
  Chemistry, Geosciences and Environmental Studies Librarian
  https://library.princeton.edu/staff/ewild
  ORCID: https://orcid.org/0000-0001-6157-7629

  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
  Publications Warehouse: https://pubs.er.usgs.gov/
  Library catalog: https://usgs.primo.exlibrisgroup.com/discovery
  Well catalog: https://my.usgs.gov/crcwc/map
  Historical Photos: https://library.usgs.gov/photo/
  NGMDB: https://ngmdb.usgs.gov/ngmdb/ngmdb_home.html
    https://www.usgs.gov/centers/new-england-water
Wait, hydrologists know about Energy & Minerals? Yes!

**Uranium Concentrations**


**Occurrence of Uranium and $^{222}$Radon in Glacial and Bedrock Aquifers in the Northern United States, 1993–2003**

**How Petroleum and Natural Gas Were Formed**

Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of sediment and rock. Over millions of years, the remains were turned deeper and deeper. The enormous heat and pressure turned them into oil and gas.

Today we drill down through the layers of sedimentary rock to reach the rock formations that contain oil and gas deposits.

**How Coal Was Formed**

Millions of years ago, dead plant matter fell into swampy water and over time, a thick layer of dead plants lay decaying at the bottom of the swamp. Over time, the surface and climate of the environment changed and the plant material was covered with sand and dirt washed in, helping the decay process, forming peat.

The remains of the peat layers and other organic layers beneath layers of plant matter under heat and pressure. This plant matter underwent chemical and physical changes, turning into coal and yielding rich hydrocarbon deposits. What once had been plants gradually turned into coal.

Coal can be found deep underground (as shown in this graphic), or it can be found near the surface.

[https://www.ndstudies.gov/](https://www.ndstudies.gov/)
Exposure Project: Dean for Research Innovation award
Innovation Fund for Research Collaborations between Artists and Scientists or Engineers
Fazal Sheikh https://www.fazalsheikh.org/
United States, Canada, Worldwide

- Earth processes that create oil, gas, coal, minerals, and uranium
- Location of natural resources
- Making renewable energy
- Land-use history
- Environmental concerns in areas with oil, gas, coal, minerals, and uranium
- Repeat Photography of landscapes

Geologic Time Scale – 2018

Cretaceous Western Interior Seaway
National Park boundaries exist where the rocks are not economically viable & Federal land often has mining and oil/gas extraction.

Driving an electric or hybrid vehicle does not mean the energy used in the vehicle is renewable.

**ELECTRIC VEHICLES**
Study: EVs 3 times more polluting than gas cars in some states
[https://www.eenews.net/energywire/2020/07/08/stories/1063524185](https://www.eenews.net/energywire/2020/07/08/stories/1063524185)

**Electricity Sources and Emissions**
[https://afdc.energy.gov/vehicles/electric_emissions.html](https://afdc.energy.gov/vehicles/electric_emissions.html)

Daily products they use are derived from oil (petroleum products).

Individuals that are climate-change deniers actually know climate change will happen and the arctic will melt, but as it does:

- Arctic ice melting will open up more water for transporting oil and gas from Alaska to Europe.
- Arctic ice melting makes it easier to extract oil from ocean i.e. oil platforms on open ocean vs. ice.

Driving an electric or hybrid vehicle does not mean the energy used in the vehicle is renewable.

- Arctic ice melting will open up more water for transporting oil and gas from Alaska to Europe.
- Arctic ice melting makes it easier to extract oil from ocean i.e. oil platforms on open ocean vs. ice.

**State Averages for Colorado**

**Electricity Sources**
- Coal: 40.08%
- Natural Gas: 30.47%
- Wind: 19.44%
- Hydro: 8.52%
- Solar: 2.15%
- Biomass: 0.29%
- Other Fossil: 0.17%
- Oil: 0.02%

**Annual Emissions per Vehicle**

- **Pounds of CO₂ Equivalent**
  - All Electric: 10k
  - Plug-in Hybrid: 11k
  - Hybrid: 18k
  - Gasoline: 30k

Example Data/Publication Sources

Water/Sediment/Soil: USGS, EPA, USDA
Indigenous Communities, USGS, Interior Dept
Oil & Gas Extraction: USGS, Interior Dept
Minerals Extraction (Uranium & Other): USGS, Interior Dept
Coal: USGS, Interior Dept
Environmental Contamination: USGS Interior Dept EPA, DoD, Energy Dept

Example Data/Publication Collection/Analysis for Projects

Water/Sediment/Soil: Quality: SW, GW, Soil Quantity: SW, GW Use of SW/GW: Homes, Agriculture
Oil & Gas Extraction: Land Air Water
Minerals Extraction (Uranium & Other): Land Air Water
Coal: Land Air Water
Environmental Contamination - Wastes from: Oil & Gas Mining Coal Nuclear
Thank you to:

USGS Minerals: https://www.usgs.gov/energy-and-minerals/mineral-resources-program

Geology, Geophysics, and Geochemistry Science Center
https://www.usgs.gov/centers/gggsc

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William Ridley
Mary Ellen Benson
Douglas B Yager
Ryan D Taylor
Russell G Tysdal

Author affiliations are listed in the Supplementary Information.
• History of the U.S. Geological Survey

• Princeton University Research

• Energy Resources: Oil, Gas, Coal, Gas Hydrates, Geothermal, Wind, Uranium, Garbage

• Mineral Resources & Commodity Information

• Ocean Mining & Space Mining

• Uranium Resources

• Environmental: Energy/Minerals/Uranium & Extraction/Uses/Wastes

https://visibleearth.nasa.gov/
USGS History: the Pre-USGS Map Area the Four Surveys, 1867-1879

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)

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

The Four Great Surveys of the West

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."
History of the U.S. Geological Survey: “Rabbitt Reports” (by Mary C. Rabbitt)

Minerals, lands, and geology for the common defence and general welfare, Volume 1, Before 1879: A history of public lands, federal science and mapping policy, and development of mineral resources in the United States


Minerals, lands, and geology for the common defence and general welfare, Volume 3, 1904-1939: A history of geology in relation to the development of public-land, federal-science, and mapping policies and the development of mineral resources in the United States from the 25th to the 60th year of the U.S. Geological Survey

Livingston folio, Montana, 1894, Folios of the Geologic Atlas 1

Ringgold folio, Georgia-Tennessee, 1894, Folios of the Geologic Atlas 2

Placerville folio, California, 1894, Folios of the Geologic Atlas 3

Kingston folio, Tennessee, 1894, Folios of the Geologic Atlas 4

Sacramento folio, California, 1894, Folios of the Geologic Atlas 5

Chattanooga Folio, Tennessee, 1892, Folios of the Geologic Atlas 6

Pikes Peak folio, Colorado, 1894, Folios of the Geologic Atlas 7

Anthracite-Crested Butte folio, Colorado, 1894, Folios of the Geologic Atlas 9

Harpers Ferry folio, Virginia-Maryland-West Virginia, 1894, Folios of the Geologic Atlas 10
USGS Library Historical Photos: [https://library.usgs.gov/photo/](https://library.usgs.gov/photo/)

- four great surveys... (1780)
- expeditions (1668)
- rocks (1599)
- mines (1542)
- mineral specimens (1337)
- mines, mills, quar... (509)
- international (427)
- quarries (342)
- photomicrographs (241)
- mills (224)
- indian reservation... (220)
- equipment (193)
- repeat photography... (161)
- specimens (155)
- hayden survey (70)
- sedimentary (57)
- foraminifera (47)
- pipelines (28)

 Structural relations of formations at Willow mine, Van Houten; north wall of canyon at the mine, showing from top to bottom Raton formation, basal conglomerate of the Raton, unconformity between Vermejo and Raton formations, coal bed within Vermejo and Trinidad sandstone. Colfax County, New Mexico. 1910.
"Emily, why do you help us find Interior Department information?"

Today: [https://www.doi.gov/bureaus](https://www.doi.gov/bureaus)

The U.S. Department of the Interior is a Cabinet-level agency that manages America's vast natural and cultural resources. Our department employs some 70,000 people, including expert scientists and resource-management professionals, in nine technical bureaus:

- Bureau of Indian Affairs
- Bureau of Indian Education
- Bureau of Land Management
- Bureau of Ocean Energy Management
- Bureau of Reclamation
- Bureau of Safety and Environmental Enforcement
- National Park Service
- Office of Surface Mining Reclamation and Enforcement
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

**USGS Spin-off agencies/bureaus**

Back to USGS

In 2010 after Deepwater Horizon, renamed Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE)

Then split into:

- Bureau of Ocean Energy Management
- Bureau of Safety and Environmental Enforcement

[Office of Natural Resources Revenue](https://www.doi.gov/bureaus)
• Undergraduate Research: https://geosciences.princeton.edu/undergraduate/undergraduate-research

• Graduate Research: https://dataspace.princeton.edu/jspui/handle/88435/dsp01c534fn95t
  Mineralogy Research: https://dataspace.princeton.edu/browse?type=subject&value=Mineralogy
  Gem & Mineral Collection: https://geosciences.princeton.edu/about/mineral-collection

• Faculty Research: https://geosciences.princeton.edu/people/faculty
  Geology: https://geosciences.princeton.edu/research/geology
  Geochemistry: https://geosciences.princeton.edu/research/geochemistry
  Geophysics: https://geosciences.princeton.edu/research/geophysics

Example: THE DUFFY RESEARCH GROUP AT PRINCETON UNIVERSITY

The willemite fluoresces green and the calcite red-orange, franklinite is non-fluorescent. http://www.fomsnj.org/
Braddock: The geology of the Jewel Cave SW quadrangle, South Dakota and its bearing on the origin of the uranium deposits in the southern Black Hills.

https://catalog.princeton.edu/catalog/2843663

https://pubs.er.usgs.gov/publication/braddock

https://pubs.er.usgs.gov/publication/ofr5910

https://pubs.er.usgs.gov/publication/b1063G
The geology of the Jewel Cave SW quadrangle, South Dakota and its bearing on the origin of the uranium deposits in the southern Black Hills

William A. Braddock
1959, Trace Elements Investigations 596
No abstract available....

Stratigraphic and structural controls of uranium deposits on Long Mountain, South Dakota

William A. Braddock
1954, Bulletin 1063-A
Numerous occurrences of uranium have been found in the Long Mountain area, Fall River County, S. Dak. Correlation diagrams prepared from drill, cores obtained from the U.S. Atomic Energy Commission indicate that the uranium is most abundant in two sandstone units, separated by mudstone in the Lakota sandstone of Early...
Glossary of Geology
https://www.americangeosciences.org/pubs/glossary

Example:
Glossary of Geology – Online for Princeton University
https://catalog.princeton.edu/catalog/8875615

List of journal articles by Bureau of Mines authors published July 1, 1910, to January 1, 1960, with subject index.
Energy Resources

Oil, Gas, Coal, Gas Hydrates, Geothermal, Wind, Uranium

- Conventional Oil and Gas Assessments
- Continuous Oil and Gas Assessments (Unconventional)

Coal Map, United States

What are gas hydrates?

World Coal Quality Inventory Data

U.S. Geological Survey Gas Hydrates Project
Oil, Gas, Coal, Gas Hydrates, **Geothermal, Wind, Uranium**

**Energy Resources**


Geothermal energy: clean power from the Earth’s heat [https://pubs.er.usgs.gov/publication/cir1249](https://pubs.er.usgs.gov/publication/cir1249)


**U.S. Wind Turbine Database**

Wind turbines = Minerals

**Critical Mineral Commodities in Renewable Energy**

**Integrated Uranium Resource and Environmental Assessment**

Uranium = a mineral, 1789
Radioactive, 1896
First Atomic Bomb (NM, USA), July 1945
First energy resource, (Idaho), Dec 1951
Joint Institutes
- CEMAC – Clean Energy Manufacturing Analysis Center
- CRES – Colorado Renewable Energy Collaboratory
- ICMC – International Center for Multiscale Characterization
- JISEA – Joint Institute for Strategic Energy Analysis
- RASEI – Renewable and Sustainable Energy Institute

Energy Frontier Research Centers
- BioLEC – Bioinspired Light-Escalated Chemistry
- CABES – Center for Alkaline-Based Energy Solutions
- CHOISE – Center for Hybrid Organic-Inorganic Semiconductors for Energy
- CNGMD – Center for Next Generation of Materials Design

Energy Materials Network Consortia
- ChemCatBio – Chemical Catalysis for Bioenergy Consortium
- DuraMAT – Durable Module Materials Consortium
- ElectroCat – Electrocatalysis Consortium
- HydroGEN – Advanced Water Splitting Materials Consortium
- HyMARC – The Hydrogen Materials—Advanced Research Consortium
- LightMAT – Lightweight Materials Consortium

Other Research Consortia and Collaborations
- BESC – BioEnergy Science Center
- CAEBAT – Computer-Aided Engineering for Electric-Drive Vehicle Batteries
- CCPC – Consortium for Computational Physics and Chemistry
- Co-Optima – Co-Optimization of Fuels and Engines
- FCIC – Feedstock-Conversion Interface Consortium
- IACMI – Institute for Advanced Composites Manufacturing Innovation
- iiESI – International Institute for Energy Systems Integration
- PVQAT – Photovoltaic Quality Assurance Task Force
- ReCell – Lithium Battery Recycling R&D Center
- SERIUS – Solar Energy Research Institute for India and the United States
- US-MAP – U.S. Manufacturing of Advanced Perovskites Consortium

By Technology
- Bioenergy
- Buildings
- Concentrating Solar Power
- Energy Analysis
- Grid Modernization
- Geothermal
- Hydrogen and Fuel Cells
- Integrated Energy Solutions
- Transportation
- Water
- Wind
Wastes – New Jersey

Waste to Energy
https://www.state.nj.us/dep/aqes/bioenergy/

Landfill Gas to Energy
The **upstream industry** finds and produces crude oil and natural gas. The upstream is sometimes known as the exploration and production (E&P) sector.

**USGS “Finding”**

World Oil & Gas Assessments:

Saudi Arabia:


United States:
https://www.usgs.gov/centers/cersc/science/united-states-assessments-undiscovered-oil-and-gas-resources?qt-science_center_objects=0#qt-science_center_objects
The **upstream industry** finds and produces crude oil and natural gas. The upstream is sometimes known as the exploration and production (E&P) sector.

https://eerscmap.usgs.gov/pwapp/
Oil & Gas: Upstream, Mid-Stream, and Downstream – make sure you know what you want
https://www.psac.ca/business/industry-overview/

The **midstream industry** processes, stores, markets and transports commodities such as crude oil, natural gas, natural gas liquids (NGLs, mainly ethane, propane and butane) and sulphur.

The **downstream industry** includes oil refineries, petrochemical plants, petroleum products distributors, retail outlets and natural gas distribution companies.
U.S. Energy Information Administration [https://www.eia.gov/](https://www.eia.gov/)

- [https://www.eia.gov/petroleum/](https://www.eia.gov/petroleum/)
- [https://www.eia.gov/nuclear/](https://www.eia.gov/nuclear/)
Mineral Resources Program

Mineral Statistics and Commodity Information
Information on domestic and international supplies and uses of mineral commodities essential to the U.S. economy and national security.

https://www.usgs.gov/energy-and-minerals/mineral-resources-program

Geology, Geophysics, and Geochemistry Science Center

Welcome to the Geology, Geophysics, and Geochemistry Science Center (GGGSC) located in Lakewood, Colorado on the Denver Federal Center. At GGGSC, we apply expertise in geology, geophysics, and geochemistry to interdisciplinary efforts in support of the USGS mission to address the Nation’s important earth science issues, with an emphasis on mineral resources.

https://www.usgs.gov/centers/gggsc
THE ROLE OF NONFUEL MINERALS IN THE U.S. ECONOMY
(ESTIMATED VALUES IN 2019)

NET EXPORTS OF MINERAL RAW MATERIALS
GOLD, SODA ASH, ZINC, CONCENTRATES, ETC.
Exports: $9.3 billion
Imports: $5.6 billion
Net exports: $3.7 billion

DOMESTIC MINERAL RAW MATERIALS FROM MINING
COPPER ORES, IRON ORE, SAND AND GRAVEL, STONE, ETC.
Value: $86.3 billion

METALS AND MINERAL PRODUCTS RECYCLED DOMESTICALLY
ALUMINUM, GLASS, STEEL, ETC.
Value of old scrap: $36.1 billion

NET EXPORTS OF OLD SCRAP
GOLD, STEEL, ETC.
Exports: $15.8 billion
Imports: $6.1 billion
Net exports: $9.7 billion

MINERAL MATERIALS PROCESSED DOMESTICALLY
ALUMINUM, BRICK, CEMENT, COPPER, FERTILIZERS, STEEL, ETC.
Value of shipments: $770 billion

NET IMPORTS OF PROCESSED MINERAL MATERIALS
METALS, CHEMICALS, ETC.
Imports: $139 billion
Exports: $86 billion
Net imports: $53 billion

VALUE ADDED TO GROSS DOMESTIC PRODUCT BY MAJOR INDUSTRIES THAT CONSUME PROCESSED MINERAL MATERIALS
Value: $3.130 billion

U.S. ECONOMY
Gross Domestic Product: $21.429 billion

*Major consuming industries of processed mineral materials are construction, durable goods manufacturers, and some nondurable goods manufacturers. The value of shipments for processed mineral materials cannot be directly related to gross domestic product.

2019 U.S. NET IMPORT RELIANCE

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Percent</th>
<th>Import Importance (2010-19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic (all forms)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Asbestos</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Cesium</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Fluorite</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Gallium</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Graphite (natural)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Indium</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Manganese</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Mica, sheet (silicon)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Neptunium</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Niobium (vanadium)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Rare Earths (rare)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Rhenium</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Silver</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Thorium</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Titania (natural)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Tungsten</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Uranium</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Zirconium</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

USA Rare Earth, the funding and development partner of the Round Top heavy rare earth project and Texas Mineral Resources announced Thursday that its rare earths pilot plant processing facility in Wheat Ridge, Colorado has received the required permits and officially opened.

Once fully commissioned, the plant will be focused on group separation of the rare earths. The rare earths processing facility opens in Colorado.

For Princeton University students/faculty/staff
https://www.eenews.net/get_access?site_link=1
(Should also work for USGS/Interior employees)

https://www.eenews.net/ew
Estimation of groundwater flow through Yucca Flat based on a multiple-well aquifer test at well ER-6-1–2 main, Nevada National Security Site, southern Nevada
Tracie R. Jackson, Keith J. Halford
The rate of groundwater flow past underground nuclear testing areas in Yucca Flat at the Nevada National Security Site, southern Nevada, was estimated using results from the ER-6-1-2 main multiple-well aquifer test (MWAT), done during February 5–July 23, 2004. Drawdowns in 13 observation wells were evaluated from pumping in well...

Documentation of single-well aquifer tests and integrated borehole analyses, Pahute Mesa and Vicinity, Nevada
Rebecca J. Frus, Keith J. Halford
Single-well aquifer testing has been carried out at Pahute Mesa in southern Nevada since 1962. These tests include single-well pumping and slug tests to estimate geologic formation hydraulic properties. Initially, aquifer tests focused on identifying low-permeability rocks suitable for testing large-yield nuclear devices, whereas later hydrologic investigations focused on potential...

Conceptual framework and trend analysis of water-level responses to hydrologic stresses, Pahute Mesa–Oasis Valley groundwater basin, Nevada, 1966-2016
Tracie R. Jackson, Joseph M. Fenelon
This report identifies water-level trends in wells and provides a conceptual framework that explains the hydrologic stresses and factors causing the trends in the Pahute Mesa–Oasis Valley (PMOV) groundwater basin, southern Nevada. Water levels in 79 wells were analyzed for trends between 1966 and 2016. The magnitude and duration of...

Hydraulic characterization of volcanic rocks in Pahute Mesa using an integrated analysis of 16 multiple-well aquifer tests, Nevada National Security Site, 2009–14
C. Amanda Garcia, Tracie R. Jackson, Keith J. Halford, Donald S. Sweetkind, Nancy A. Damar, Joseph M. Fenelon, Steven R. Reiner
An improved understanding of groundwater flow and radionuclide migration downgradient from underground nuclear-testing areas at Pahute Mesa, Nevada National Security Site, requires accurate subsurface hydraulic characterization. To improve conceptual models of flow and transport in the complex hydrogeologic system beneath Pahute Mesa, the U.S. Geological Survey characterized bulk hydraulic properties...

The road to Yucca Mountain—Evolution of nuclear waste disposal in the United States
John S. Stuckless, Robert A. Levich
2016, Environmental & Engineering Geoscience (22) 1-25
The generation of electricity by nuclear power and the manufacturing of atomic weapons have created a large amount of spent nuclear fuel and high-level radioactive waste. There is a world-wide consensus that the best way to protect mankind and the environment is to dispose of this waste in a deep...
Thank you! Questions?