

Overview of Nevada Regional Mineral Exploration Data

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Nevada Bureau of Mines and Geology

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Data Providers

The Nevada Bureau of Mines and Geology (NBMG)

The Nevada Bureau of Mines and Geology is Nevada's state geological survey and is a research and public-service unit of the University of Nevada, Reno. It focuses on defining the geologic framework, subsurface mineral and energy resources, and geologic hazards of the state through mapping, field studies, analytical work, and digitization of historical data. NBMG's precompetitive products, including geologic maps, reports, and open data, form a primary geoscience foundation for exploration, land-use planning, and academic research across Nevada.

Website: <https://nbg.unr.edu/>

Center for Research in Economic Geology (CREG)

The Ralph J. Roberts Center for Research in Economic Geology is an applied research and graduate training center focused on the geology, geochemistry, geophysics, genesis, and exploration of ore deposits, including Nevada's world-class Carlin-type and related systems. CREG operates in partnership with industry and federal agencies to support thesis-driven research that advances deposit models and directly informs exploration strategies in Nevada and comparable provinces worldwide.

Great Basin Center for Geothermal Energy (GBCGE)

The Great Basin Center for Geothermal Energy specializes in the characterization of geothermal resources across the Basin and Range, Western U.S., by integrating structural geology, geophysics, and geochemistry datasets. Recent work, funded by the U.S. Department of Energy Geothermal Technology Office, has involved a regional data compilation and feature engineering effort (INGENIOUS, project no. EE0009254). Some of these regional data layers provide valuable analogues for hydrothermal ore systems and can inform exploration for both geothermal energy and fluid-driven mineralization.

Geologic Mapping Program

NBMG's Geologic Mapping Program produces detailed maps that characterize age, composition, and spatial relationships among rocks units at and near the Earth's surface, at scales relevant to exploration and hazard assessment. These maps support mineral systems analysis in Nevada by delineating prospective host rocks, key fault and fold systems, volcanic and sedimentary architectures, and the distribution of cover, and they are routinely used by industry to constrain 3D models and exploration targeting.

The Nevada Division of Minerals (NDOM)

The Nevada Division of Minerals is the state agency responsible for overseeing exploration and development of mineral and geothermal resources, with a strong focus on data collection, permitting, and public reporting. Well, borehole, and drilling datasets covering geothermal, oil and gas, and certain mineral exploration holes, provide critical information on subsurface stratigraphy, temperature gradients, fluid occurrences, and drilling histories that complement geological and geophysical interpretations in exploration programs. NDOM partners with NBMG for curation and distribution of historical records and samples related to both mining and drilling activity.

Website: <https://minerals.nv.gov/>

The U.S. Geological Survey (USGS)

The U.S. Geological Survey is a federal earth science agency that conducts nationwide programs in geology, geophysics, geochemistry, hydrology, and related disciplines to support resource assessment and hazard mitigation. For mineral exploration, USGS provides extensive regional geochemical datasets (rock, soil, and stream sediment), airborne and ground geophysical surveys (magnetic, radiometric, gravity), and modern aerial acquisitions such as LiDAR that are integrated into resource models and critical minerals research.

Website: <https://www.usgs.gov/>

Earth Mapping Resources Initiative (Earth MRI)

Earth MRI is a national multi-agency program led by USGS that aims to improve knowledge of the geologic framework and critical mineral potential of the United States. It funds and coordinates new geologic mapping, geochronology, geochemistry, and high-resolution geophysical and remote-sensing surveys in priority areas, including Nevada, thereby generating precompetitive datasets that significantly enhance the ability to identify and evaluate concealed or underexplored mineral systems.

3D Elevation Program (3DEP)

The 3D Elevation Program is a USGS program tasked with acquiring consistent, high-quality elevation data, primarily via airborne LiDAR, across the United States. In Nevada, these efforts include recent acquisitions such as Geoscience Data Acquisition for Western Nevada (GeoDAWN), under Earth MRI, which deliver high-resolution bare-earth digital elevation models useful for mapping faults, lineaments, subtle geomorphic expressions of alteration or historical workings, and infrastructure constraints. Such elevation products are increasingly integrated with geologic and geophysical data to refine structural interpretations and support both exploration targeting and mine planning.

National Cooperative Geologic Mapping Program (NCGMP)

The National Cooperative Geologic Mapping Program (NCGMP) is a core U.S. Geological Survey initiative that coordinates and funds systematic geologic mapping and related geoscience across the United States to improve understanding of the nation's geology, resources, and hazards. The program integrates federal, state, and academic efforts to produce modern digital geologic maps and supporting datasets that are foundational for mineral and energy exploration, groundwater and engineering studies, land-use planning, and more. Within NCGMP, the STATEMAP component provides competitive funding to state geological surveys to conduct new or updated geologic mapping in priority areas, often accompanied by stratigraphic, structural, and geochronologic compilation with new dating where needed. These products feed into national databases, enhance 3D geologic models, and supply essential context for industry and research applications.

The National Aeronautics and Space Administration (NASA)

NASA is the U.S. civil space agency responsible for space exploration, earth observation, and remote-sensing research. For mineral exploration, NASA's Earth-observing missions and airborne campaigns provide multispectral and hyperspectral imagery, thermal data, and topographic information that support regional mapping of lithology, alteration, and surface processes.

Website: <https://www.nasa.gov/>

Jet Propulsion Laboratory (JPL)

NASA's Jet Propulsion Laboratory develops and operates many advanced Earth remote-sensing instruments, including the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS). AVIRIS hyperspectral data capture continuous spectra across visible to infrared wavelengths, enabling detailed mapping of alteration minerals (clays, carbonates, sulfates, iron oxides) and lithologic variations relevant to hydrothermal and sediment-hosted mineral systems. JPL's processing, calibration, and distribution of these datasets make them a key resource for researchers applying spectral mineral mapping to exploration problems.

Precompetitive Regional Exploration Datasets

Airborne magnetic, radiometric

High-resolution aeromagnetic and aeroradiometric surveys measure subtle variations in the Earth’s magnetic field and natural radioelement concentrations (K, Th, U) in near-surface materials. These datasets are widely used to map lithologic boundaries, faults, intrusive bodies, and alteration systems that may control mineralization, even where bedrock is concealed by cover. Aeromagnetic and aeroradiometric data can help delineate mafic–ultramafic bodies, structures, and magnetic lineaments associated with porphyry, skarn, and iron oxide systems, as well as alteration halos linked to epithermal and intrusive deposits (Hanna, 1990; Allis, 1990). Within the USGS Earth MRI, such surveys are being systematically acquired and reprocessed to improve targeting of critical mineral systems in covered and structurally complex terrains.

Dataset	Regional airborne electromagnetic and magnetic surveys of the Basin and Range Province in Nevada, Oregon, and California, 2022-2023
Provider/Program	USGS Earth MRI
Publication date	2025-08-27
Horizontal resolution	1,000-meter grid
CRS	EPSG:32611
File format(s)	.shp, WMS/WFS, geotiff
Link(s)	https://www.sciencebase.gov/catalog/item/65c3a97ed34ef4b119cae594
DOI	10.5066/P1UKDJSM

Dataset	GeoDAWN: Airborne magnetic and radiometric surveys of the northwestern Great Basin, Nevada and California
Provider/Program	USGS Earth MRI, U.S. Department of Energy
Publication date	2024-03-01
Horizontal resolution	Various; 50 to 100-meter grids
CRS	EPSG:32611
File format(s)	.gdb, .shp
Link(s)	https://www.sciencebase.gov/catalog/item/657e1d85d34e23d3533209f7
DOI	10.5066/P93LGLVQ

Dataset	Airborne magnetic and radiometric survey of the southeast Mojave Desert, California and Nevada
Provider/Program	USGS Earth MRI
Publication date	2020-04-29
Horizontal resolution	50-meter grid
CRS	EPSG:26911
File format(s)	.shp, WMS/WFS
Link(s)	https://www.sciencebase.gov/catalog/item/5e7be5eee4b01d50927301b3
DOI	10.5066/P9UWYYK9

Dataset	Regional geophysical maps of the Great Basin, USA
Provider/Program	USGS

Publication date	2022-07-28
Horizontal resolution	1,000-meter grids
CRS	Albers Equal Area Conic projection (USA-Contiguous, Central Meridian=-117)
File format(s)	geotiff
Link(s)	https://www.sciencebase.gov/catalog/item/628d4fabd34ef70cdba3c4a4
DOI	10.5066/P9Z6SA1Z

Borehole samples, logs

Borehole core and cuttings samples, together with associated lithologic and geophysical logs, can provide direct subsurface constraints on stratigraphy, structure, alteration, and mineralization. These datasets bridge the gap between surface mapping and geophysical interpretation, allowing more accurate three-dimensional models of ore systems and host rocks. Archived materials and records curated by agencies such as the NBMG and NDOM can be re-logged and re-assayed for new commodities, or integrated with modern deposit models to validate geophysical anomalies and reduce drilling risk in ongoing exploration.

Dataset	NBMG Subsurface Database Explorer and GIS web services
Provider/Program	NBMG, NDOM
Publication date	Various
Horizontal resolution	Various
CRS	EPSG:4269
File format(s)	REST/GeoJSON, .las, .pdf, .csv
Link(s)	https://nbmg.maps.arcgis.com/home/item.html?id=ed66f9f99cf54bcab12fb69095bf1c1c
DOI	10.15121/1987556

Epithermal deposits

Epithermal deposit inventories compile the locations and characteristics of sinters, silicified sediments, alteration, and other observations commonly associated with epithermal systems. These features, identified via field mapping activity or with satellite imagery, can indicate where hydrothermal fluids once vented and flowed. Such inventories can help to constrain where epithermal or porphyry-style mineralization is concealed at depth (John, 2018).

Dataset	INGENIOUS - Great Basin Regional Dataset Compilation, Paleo Geothermal Features
Provider/Program	NBMG
Publication date	2022-08-16
Horizontal resolution	N/A
CRS	EPSG:4269
File format(s)	.shp, .csv
Link(s)	https://gdr.openei.org/submissions/1391
DOI	10.15121/1881483

Geochemistry

Regional geochemical datasets from the National Uranium Resource Evaluation (NURE) program include multi-element analyses of stream sediments, soils, and waters collected on a systematic grid. Although originally focused on uranium, these data provide broad geochemical coverage for many elements relevant to base, precious, and critical metals. When combined with geology and geophysics, geochemistry data can help delineate anomalies or dispersion patterns that may indicate concealed mineral systems. Since origination in the 1970s-80s, the USGS has published results of multiple reanalysis and reformatting efforts for NURE data. The USGS also maintains a National Geochemical Database for rock chip samples collected by USGS personnel and partnered institutions.

Dataset	Reanalysis of Selected Archived NURE-HSSR Sediment and Soil Samples from Arizona, California, Idaho, Montana, Nevada, New Mexico, and Utah
Provider/Program	USGS, U.S. Atomic Energy Commission, U.S. Department of Energy
Publication date	2018-01-18
Horizontal resolution	Various
CRS	EPSG:4267
File format(s)	.shp, .csv, .accdb
Link(s)	https://www.sciencebase.gov/catalog/item/5a0b3136e4b09af898cb6f56
DOI	10.5066/F7765DHF

Dataset	Multielement Geochemical Dataset of Surficial Materials for the Northern Great Basin
Provider/Program	USGS, U.S. Atomic Energy Commission, U.S. Department of Energy
Publication date	2002
Horizontal resolution	Various
CRS	EPSG:4267
File format(s)	.xls, .csv
Link(s)	https://pubs.usgs.gov/of/2002/0227/intro.html
DOI	10.3133/ofr02227

Dataset	National Geochemical Database: Rock
Provider/Program	USGS
Publication date	Various
Horizontal resolution	Various
CRS	EPSG:4326
File format(s)	.kml, .shp, WMS/WFS
Link(s)	https://mrdata.usgs.gov/ngdb/rock/
DOI	N/A

Geochronology

Geochronologic datasets (e.g., U–Pb, Ar–Ar) can constrain the timing of magmatism, metamorphism, deformation, and mineralization at various spatial scales. By establishing temporal relationships between ore formation and tectono-magmatic events, these data can help to refine mineral system models and improve the definition of fertile time–space windows (Chelle-Michou and Schaltegger,

2023). Age constraints from NBMG, USGS, and collaborators allow researchers to correlate mineralizing events across belts, distinguish multiple mineralization pulses, and assess whether specific intrusions, volcanic episodes, or structural events are genetically linked to known deposits. This temporal framework can facilitate more predictive targeting strategies, particularly when integrated with isotopic and geochemical signatures.

Dataset	USGS Geochron: A Database of Geochronological and Thermochronological Dates and Data (ver. 4.0, May 2025)
Provider/Program	USGS NCGMP, NBMG
Publication date	2024-05-17
Horizontal resolution	Various
CRS	EPSG:4326
File format(s)	GeoJSON, .shp, .kml, .csv
Link(s)	https://www.sciencebase.gov/catalog/item/63345053d34e900e86c69f1a , https://apps.usgs.gov/geochron_database_explorer/
DOI	10.5066/P9RZNPIF

Geology

Regional and detailed geologic maps provide the fundamental framework for exploration work, describing the distribution of rock units, structures, alteration zones, and surficial cover. NBMG mapping in Nevada synthesizes decades of fieldwork and research, often integrating stratigraphy, structural geology, and magmatism into coherent 2D and increasingly 3D models. For mineral exploration, these datasets support delineation of favorable host lithologies, identification of key structures (e.g., faults, folds, shear zones), and interpretation of basin architecture and cover thickness. They also provide critical context for interpreting geophysical and geochemical anomalies and for extrapolating subsurface geology where drill control is sparse.

Dataset	Nevada Geologic Maps web application
Provider/Program	NBMG
Publication date	Various
Horizontal resolution	Various
CRS	Various
File format(s)	REST/GeoJSON
Link(s)	https://gisweb.unr.edu/GeologicMaps/
DOI	N/A

Dataset	NBMG Geologic Map publications
Provider/Program	NBMG
Publication date	Various
Horizontal resolution	Various
CRS	Various
File format(s)	Georeferenced .pdf, .gdb (free by request for academic purposes, where available)
Link(s)	https://pubs.nbmgs.unr.edu/
DOI	N/A

Dataset	NCGMP MapView web application
Provider/Program	USGS NCGMP
Publication date	Various
Horizontal resolution	Various
CRS	Various
File format(s)	Georeferenced .pdf
Link(s)	https://ngmdb.usgs.gov/mapview
DOI	N/A

Gravity anomaly, depth-to-basement

Gravity surveys measure variations in the Earth’s gravitational field caused by density contrasts between rock bodies, helping define basin geometry, major faults, and intrusive complexes. Interpreted gravity and derived depth-to-basement models are particularly valuable in regions with extensive sedimentary or volcanic cover, where basement structure and thickness cannot be directly observed. In exploration, these data can inform understanding of sedimentary basins hosting lithium brines or sediment-hosted metals, as well as the location of structures that may focus hydrothermal fluids. Gravity-derived depth-to-basement models can also assist in delineating prospective basement highs, uplifted blocks, and basin-bounding faults that localize mineral systems. Gravity inversions are inherently non-unique and should be synthesized with other datasets to add context to interpretations.

Dataset	Regional geophysical maps of the Great Basin, USA
Provider/Program	USGS
Publication date	2022-07-28
Horizontal resolution	1,000-meter grids
CRS	Albers Equal Area Conic projection (USA-Contiguous, Central Meridian=-117)
File format(s)	Geotiff
Link(s)	https://www.sciencebase.gov/catalog/item/628d4fabd34ef70cdba3c4a4
DOI	10.5066/P9Z6SA1Z

Hyperspectral

Airborne hyperspectral imaging, such as data from NASA’s AVIRIS, measure continuous spectra across dozens to hundreds of narrow wavelength bands, enabling detailed mineral mapping at the surface. Unique spectral signatures can help differentiate among clay, carbonate, sulfate, iron oxide, and other alteration minerals that commonly form halos around hydrothermal systems, including porphyry, epithermal, and Carlin-type deposits (Kruse, 2004). Hyperspectral datasets thus support rapid regional-scale alteration mapping, vectoring in on prospective zones, and refinement of lithologic interpretations in poorly exposed terrains. They can be particularly informative when integrated with field spectroscopy, geologic mapping, and other geophysical layers.

Dataset	Airborne Visible/InfraRed Imaging Spectrometer Data
Provider/Program	NASA JPL
Publication date	Various

Horizontal resolution	Various, ~15-meter grids
CRS	Various
File format(s)	.nc, .kml, .csv
Link(s)	https://popo.jpl.nasa.gov/mmgis-aviris/?mission=AVIRIS
DOI	N/A

LiDAR

Light Detection and Ranging (LiDAR) uses laser ranging from aircraft to generate high-resolution digital elevation models and, where available, detailed surface (bare-earth) and vegetation structure. USGS programs and initiatives, such as the 3D Elevation Program (3DEP) and Earth MRI GeoDAWN, provide standardized, accurate elevation data that are invaluable for structural analysis. In mineral exploration, LiDAR bare-earth elevation models facilitate precise mapping of faults, fractures, lineaments, volcanic and sedimentary architectures, and subtle landforms that may indicate alteration or historical workings. Data also improve base mapping for field campaigns, support hazard assessment for future development, and can be combined with orthophotography and other datasets to refine geological interpretations in both exposed and lightly vegetated areas.

Dataset	3DEP LiDAR Explorer and web service
Provider/Program	USGS 3DEP
Publication date	Various
Horizontal resolution	Nevada-statewide DEM coverage complete or in progress at QL2 (1-meter) or better
CRS	EPSG:3857
File format(s)	Geotiff, .las, REST/GeoJSON
Link(s)	https://apps.nationalmap.gov/lidar-explorer/#/ , https://elevation.nationalmap.gov/arcgis/rest/services/3DEPElevation/ImageServer
DOI	N/A

Magnetotelluric

Magnetotelluric (MT) methods measure subsurface electrical resistivity, which is sensitive to variations in fluid content, clay alteration, graphite, sulfides, and salinity. MT provides deep crustal to upper-mantle resistivity structure, useful for understanding large-scale tectonic controls and deep fluid pathways, whereas electromagnetic techniques (airborne or ground-based) typically resolve shallower targets relevant to many ore systems. These datasets can delineate conductive zones associated with alteration, sulfide bodies, or brine systems, and can highlight resistive intrusions or structural blocks that influence fluid flow (Rodriguez and Williams, 2001; Hearst, 2018). Integration of MT with other geophysical and geologic datasets can enhance subsurface models, particularly in covered terrains where direct geological observations are limited.

Dataset	Electrical Conductance Maps of the Great Basin, USA
Provider/Program	USGS, U.S. Department of Energy
Publication date	2022-06-23

Horizontal resolution	1,000-meter grids
CRS	EPSG:4269
File format(s)	Geotiff
Link(s)	https://www.sciencebase.gov/catalog/item/62979746d34ec53d276c113b
DOI	10.5066/P9TWT2LU

Mining districts

Mining district datasets include information on the spatial extent, commodity focus, production history, and key deposits within defined areas. NBMG compilations include district boundaries, principal mines and prospects, dominant deposit types, and historical documents (maps, assays, reports, etc.) donated by industry for digitization and accession into the public domain. In exploration, mining district data can help contextualize new targets within established trends, highlight gaps in exploration coverage, and indicate waste sites for potential re-mining.

Dataset	Nevada mining district boundaries
Provider/Program	NBMG
Publication date	1998
Horizontal resolution	N/A
CRS	EPSG:26911
File format(s)	REST/GeoJSON, .shp
Link(s)	https://nbgm.maps.arcgis.com/home/item.html?id=567b9e310c9a40b899cfb2b3d49de01c
DOI	N/A

Dataset	Nevada mining district historical document collection
Provider/Program	NBMG
Publication date	Various
Horizontal resolution	N/A
CRS	N/A
File format(s)	.pdf
Link(s)	https://collections.nbgm.unr.edu/pages/search.php?search=%21collection789818
DOI	N/A

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