Mackay School of Earth Sciences and Engineering
College of Science
University of Nevada, Reno

# NEVADA BUREAU OF MINES AND GEOLOGY

# OPEN-FILE REPORT 08-6

## Biennial Report of the Nevada Bureau of Mines and Geology

## 2008

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State Geologist and Director

PREPARED FOR

**The Board of Regents of the Nevada System of Higher Education**

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Cover photograph:
Evaporation pond at Chemetall Foote Corporation’s lithium mine in Clayton Valley, near Silver Peak, Esmeralda County, Nevada. This mine, which produces lithium from brine in the valley sediments, is the nation’s only lithium producer. The brine is pumped to the surface, evaporated over a period of 18 to 24 months, past the saturation point of halite, NaCl, then processed to precipitate lithium carbonate. Lithium demand is likely to rise because of its use in light-weight, efficient batteries. The dark hill that is reflected in the pond is a cinder cone; it erupted approximately 390,000 years ago, during the Pleistocene Epoch of the Quaternary Period. Similar volcanoes occur near Yucca Mountain. The Nevada Bureau of Mines and Geology established an EarthCache site on the side of this volcano (http://www.nbmg.unr.edu/earthcache/CinderConeinClaytonValley.pdf). EarthCaches, which are located with hand-held global positioning system (GPS) instruments, provide opportunities for the public to learn about our fascinating landscape and resources.

**Biennial Report of the**
**Nevada Bureau of Mines and Geology**
**2008**

## EXECUTIVE SUMMARY

The Nevada Bureau of Mines and Geology (NBMG) is a research and public service unit of the University of Nevada, Reno and is the state geological survey. Established by the Nevada Legislature as a department within the public service division of the Nevada System of Higher Education, NBMG is part of the Mackay School of Earth Sciences and Engineering within the College of Science and one of the Statewide Programs at the University of Nevada, Reno. NBMG's mission, to provide the state's needs for geological and mineral-resource information and research, is defined in its enabling legislation. NBMG scientists conduct research and publish reports that focus on the economic development, public safety, and quality of life in urban and rural areas of Nevada. We stimulate economic diversification and development in the state, save lives, and protect property.

**URBAN GROWTH - NATURAL HAZARDS AND ECONOMIC STABILITY**

- Earthquakes
- Floods
- Subsidence and Fissures due to Groundwater Withdrawal
- All Hazards

**MINERAL, ENERGY, AND WATER RESOURCES VITAL TO ECONOMIC EXPANSION**

- Precious and Base Metals
- Industrial Minerals, including Construction Raw Materials
- Geothermal Energy and Other Forms of Renewable Energy
- Petroleum
- Uranium

**ENVIRONMENTAL CONCERNS**

- Mercury and Other Chemical Hazards from Historical Mining and Natural Sources
- Global Change
- Nuclear Waste
- Riparian Restoration

**SCIENCE TO UNDERPIN THE APPLICATIONS**

- Geologic Framework – With Applications in Resources, Hazards, and Environment
- Tectonics and Earth Processes
- Global Geodesy

**EARTH SCIENCE EDUCATION AND OUTREACH TO THE PUBLIC**

- Outreach to the General Public, K-12 Teachers, and Students
- Outreach to Professionals

This report provides details on the activities of NBMG scientists and support staff during the past two years. The University of Nevada, Reno is strategically planning for the future, and this report incorporates key elements of NBMG's strategic plan for the next five to ten years. As indicated in the lists of publications, research grants, and other professional activity, NBMG has been highly productive and valuable to the State of Nevada. In accordance with Nevada Revised Statute 514.070, which calls for a biennial report on NBMG activities, it is my pleasure to transmit this report on behalf of the NBMG staff.

Jonathan G. Price
State Geologist and Director

# INTRODUCTION

NBMG scientists conduct research and publish reports on mineral and energy resources, engineering geology, environmental geology, earthquakes and other hazards, groundwater, and geologic mapping in Nevada. The maps and geologic reports produced by NBMG provide basic information used by a broad spectrum of individuals, including engineers involved in construction, conservationists, exploration geologists, miners, highway planners, urban planners, historians, students, professors and K-12 teachers, tourists, and Nevadans enjoying outdoor recreation.

In addition, NBMG provides special services in the areas of analytical geochemistry and assay standards, mineral and rock identification, sample curation, earth-science education and in-service teacher training, continuing education for professional geoscientists, geologic and geotechnical information, mineral- and energy-resource information, geographic information systems, electronic databases, and historical information, particularly regarding mining and natural hazards. NBMG works closely with many local, state, and federal agencies. Considerable information about NBMG can be found on the Web (www.nbmg.unr.edu).

Major research projects are being conducted throughout Nevada. Geologic maps are being produced in areas that will be undergoing urban and suburban development, in areas where environmental concerns are most critical, and in areas where the potential is high for the development of mineral, energy, and water resources. It typically takes one to two person-years of effort to complete each 7.5-minute (1:24,000-scale) quadrangle. These maps provide the basis for nearly all geological research and for many engineering applications. Significant hazards in southern Nevada include flash floods, subsidence and related open cracks in the ground (fissures), swelling and collapsing soils, and earthquakes. In northern Nevada, earthquake, landslide, flood, and soil-condition hazards dominate, but other concerns, including locally high concentrations of naturally occurring radon and arsenic, are also best understood from a basis of geologic maps. Geologic mapping in northeastern Nevada is revealing much about the origin of the gold deposits that have made Nevada the nation's foremost gold-producing state and the United States the fourth leading producer of gold in the world.

Research on land subsidence in Las Vegas Valley provides valuable information about the rates of subsidence resulting from groundwater withdrawals and the development of fissures that can cause considerable damage to buildings. NBMG researchers, in collaboration with other experts, are using the most current technologies to attack this problem—geodetic measurements using the global positioning system (GPS) and interferometry using synthetic aperture radar (InSAR), a remote-sensing technique. NBMG is also evaluating concerns regarding subsidence and fissures in other desert valleys, where groundwater is being pumped to supply the needs of expanding populations or for mines.

NBMG and Nevada Seismological Laboratory scientists assess earthquake hazards throughout the state. NBMG geologists evaluate the geologic record for evidence of prehistoric earthquakes. There is abundant evidence that nearly all parts of Nevada have experienced earthquakes with magnitudes in excess of 6.5 during the last several hundred thousand years. NBMG's research complements the work of the Nevada Seismological Laboratory, which monitors earthquakes ranging from magnitudes less than one to the largest earthquakes in the world. From historical and instrumental records, we know that Nevada experiences a magnitude 7.0 or greater earthquake about once every 30 years. The largest earthquakes yet recorded in the state, the magnitude 7.3 to 7.8 event in Pleasant Valley near Winnemucca, occurred in 1915. The last magnitude 7 earthquake was at Fairview Peak near Fallon in 1954. Much more needs to be done, scientifically and in outreach to the public, to reduce the risks from natural hazards.

The magnitude 6.0 earthquake near Wells in February, 2008, and the swarm of earthquakes that included a magnitude 4.7 at Mogul in April highlighted our need to be prepared for earthquakes. NBMG’s leading earthquake geologist joined the Nevada Division of Emergency Management’s team that responded to the

Wells earthquake, and we were successful in putting NBMG Special Publication 27, *Living with Earthquakes in Nevada*, in the hands of residents in the Mogul area before the largest of the earthquakes. Because residents followed the publication's instructions for securing items to avoid damage during an earthquake, perhaps millions of dollars in potential damage was avoided. With the assistance of the Federal Emergency Management Agency (FEMA), we were also able to distribute this publication as a Sunday supplement in the Reno Gazette-Journal. The public's heightened awareness about earthquakes will help to save lives. We have used FEMA's loss-estimation model, a computer simulation of earthquakes of a given size, to indicate that a major earthquake either in the Las Vegas or Reno-Carson City areas, like ones that have occurred in the geological past and will occur in the future, could cause hundreds of fatalities and billions of dollars in economic loss, if we are not prepared.

Floods along major streams and flash floods along normally dry washes are all too common phenomena in Nevada. NBMG research is helping to understand the frequency and severity of past floods. Efforts are underway in southern, northwestern, and north-central Nevada to determine the timing, magnitude, and frequency of these events.

Geological aspects of waste disposal are being addressed with the aid of geologic maps, which are essential in understanding groundwater flow at and away from all sites, including landfills and radioactive waste sites. Other important considerations regarding nuclear waste issues that have been addressed by NBMG investigations include tectonic strain and related earthquake and volcanic hazards and the potential for mineral-resource development.

Mineral-resource assessments are routinely needed by federal agencies with land-management responsibilities. NBMG scientists with expertise in economic geology have contributed to resource assessments by the Bureau of Land Management, Department of Defense, Department of Energy, Fish and Wildlife Service, and U.S. Geological Survey. NBMG has also evaluated environmental concerns about mining, such as potential acid-mine drainage and associated release of potentially toxic elements from abandoned and inactive mines; mercury pollution from the early days of mining on the Comstock and elsewhere, when amalgamation was the preferred method of extracting gold and silver from the ores; and predicting the future chemistry of pit lakes when modern-day open pits fill with water after mining stops.

NBMG publishes many maps and reports that assist in the exploration for, and environmentally sound development of, mineral, energy, and water resources. NBMG publishes geologic maps that are produced not only by NBMG geologists but also by geologists from industry and at universities throughout the world. The maps and reports are reviewed by peers with knowledge about the local geology.

NBMG scientists also routinely publish in peer-reviewed, internationally recognized scientific journals. NBMG scientists have fine reputations within the scientific community, and several have won awards for their extraordinary contributions. NBMG's research projects are led by teams with broad expertise in the geological sciences and geography. The geodesy team, which we have named the Nevada Geodetic Laboratory, has made significant contributions to global geophysics and space science while also focusing on issues critical to Nevada. The scientists' efforts are supported by an excellent staff in the areas of cartography, graphic design, geographic information systems (GIS), analytical services, publication sales, information technology, finance, and administration.

NBMG has leadership roles in several statewide efforts. NBMG, along with the Nevada Seismological Laboratory, provides operational support for the Nevada Earthquake Safety Council (with funding from a FEMA grant that is passed through the Nevada Division of Emergency Management). The Nevada Earthquake Safety Council facilitates public input, develops consensus about seismic issues within the public and private sectors, and is the public advisory body for state seismic policy and the Nevada Earthquake Risk Reduction Program of the Division of Emergency Management. The Board of Directors

of the Council, which votes on policy recommendations, has 22 members, from both southern and northern Nevada, representing business and industry; city, county, and state agencies, including the Assembly and Senate; geosciences; engineering; community organizations; universities; building officials; insurance; and primary-secondary education. The Council has made significant progress in improving earthquake awareness and preparedness, largely through a number of activities supported by NBMG and the Nevada Seismological Laboratory.

The NBMG Director, Jon Price, chairs the State Mapping Advisory Committee (SMAC), and NBMG's Geographic Information Systems (GIS) Supervisor, Ron Hess, serves as its executive secretary. In the early 1980s the Governor named the NBMG Director as the chair of SMAC. SMAC provides input to the United States Geological Survey on issues related to updating topographic maps, digital map products used in GIS, and geologic mapping. The Geologic Mapping Subcommittee of SMAC helps set priorities for geologic mapping according to the National Cooperative Geologic Mapping Program. Membership in SMAC is open to Nevada representatives of local, state, and federal agencies, universities, and individuals from the private sector with interests in mapping. SMAC's efforts in coordinating requests to the U.S. Department of Interior have helped make many new digital products available, including new statewide digital aerial photographs. These products are free on the Web through the University’s library.

Jon Price also chairs the Nevada Hazard Mitigation Planning Committee, which advises the Division of Emergency Management on the allocation of funds set aside by FEMA for mitigation of future disasters. Because NBMG has considerable expertise in geological hazards (particularly floods, earthquakes, landslides, subsidence, and other unstable ground conditions), NBMG has much to contribute to the efforts of reducing risks from natural disasters.

The Nevada State Board on Geographic Names was established by the Legislature to coordinate and approve geographic names within the state for official recommendation by the United States Board on Geographic Names. The State Board has representation from NBMG, faculty of the University of Nevada, Reno and the University of Nevada, Las Vegas, the State Library and Archives, State Department of Transportation, State Department of Conservation and Natural Resources, Nevada Historical Society, U.S. Bureau of Land Management, U.S. Forest Service, and the Inter-Tribal Council of Nevada, Inc. Officially recognized geographic names must be approved by both the State and U.S. Boards.

## STATUTORY MANDATES

Please refer to Appendix B for the wording of NBMG's statutory mandates under NRS 514 (establishing NBMG and its mission), NRS 396 (concerning the analysis of ores, minerals, soil, and water submitted by residents of Nevada), NRS 327 (concerning the Nevada State Board on Geographic Names), NRS 519A (concerning fees collected by the Nevada Division of Environmental Protection to fund cooperative agreements between NBMG and the U.S. Geological Survey), NAC 522 (concerning responsibilities to archive samples and records from oil and gas wells), NAC 534A (concerning responsibilities to archive samples and records from geothermal wells), and 43 USC Sec. 31c (concerning requirements for participation in the National Cooperative Geologic Mapping Program).

## Addressing Nevada's Critical Needs - Economic Development

Geologic maps and related reports on applied research are excellent incentives for economic development. As an example, geologic mapping and related interpretation of the regional geological structures were an integral part of the discovery of the Carlin gold deposit in 1961. In the last 28 years, mining companies in Nevada have produced tens of billions of dollars worth of gold and silver from deposits of this type and have directly and indirectly provided high-paying jobs for tens of thousands of Nevadans. There is still much mineral wealth to be found in Nevada, particularly buried under volcanic rocks and alluvium in basins between the mountain ranges. In 1988, we estimated that the undiscovered mineral resources in Nevada were likely to have a value in the range of $120 billion to $1.2 trillion, and those figures still provide a reasonable estimate of the untapped mineral wealth of Nevada.

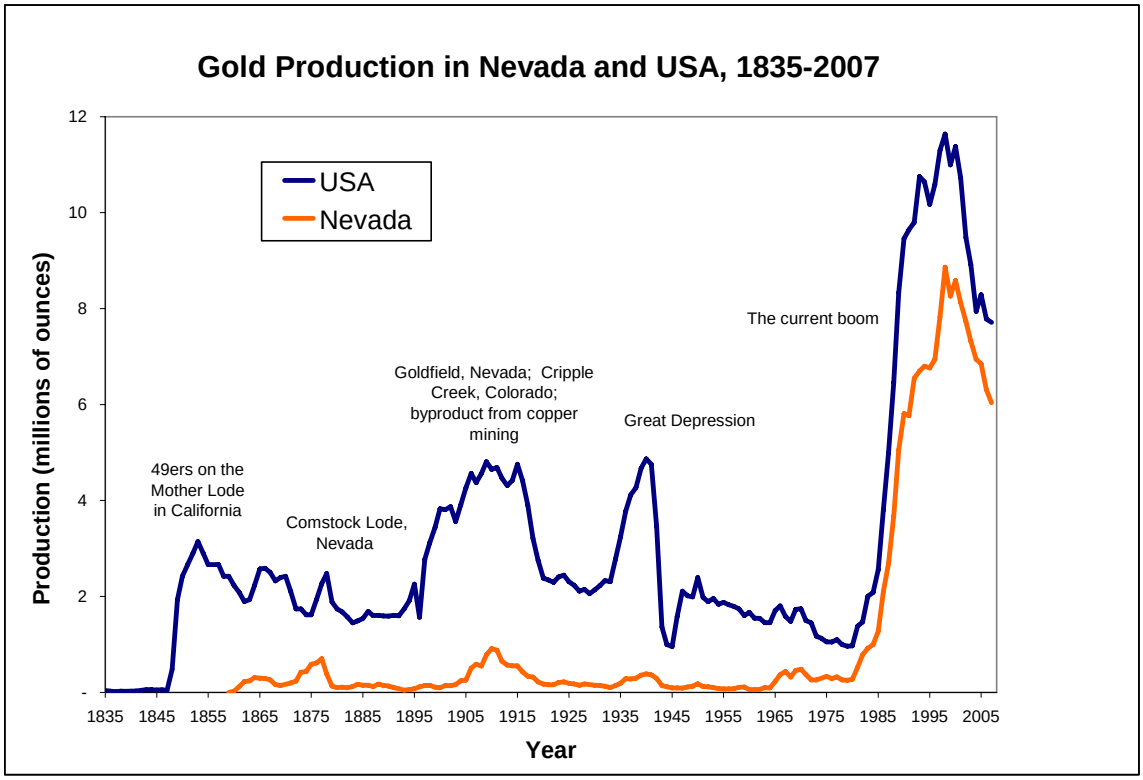
Geologic maps in urban areas help businesses avoid unstable areas (such as active faults and locations prone to liquefaction during earthquakes, flash floods, landslides, subsidence, and swelling soils) and help to protect valuable groundwater resources. Approximately 20% of the state is geologically mapped at a scale that is adequate for most applications in mineral, energy, and water resources; hazards; and environmental protection. At our current rate of production, including NBMG programs that encourage more geologic mapping by individuals from the U.S. Geological Survey, universities, and the private sector, we have several decades of work ahead of us in geologic mapping alone. A fact sheet explaining the work in Nevada through the National Cooperative Geological Mapping Program is appended at the end of this report.

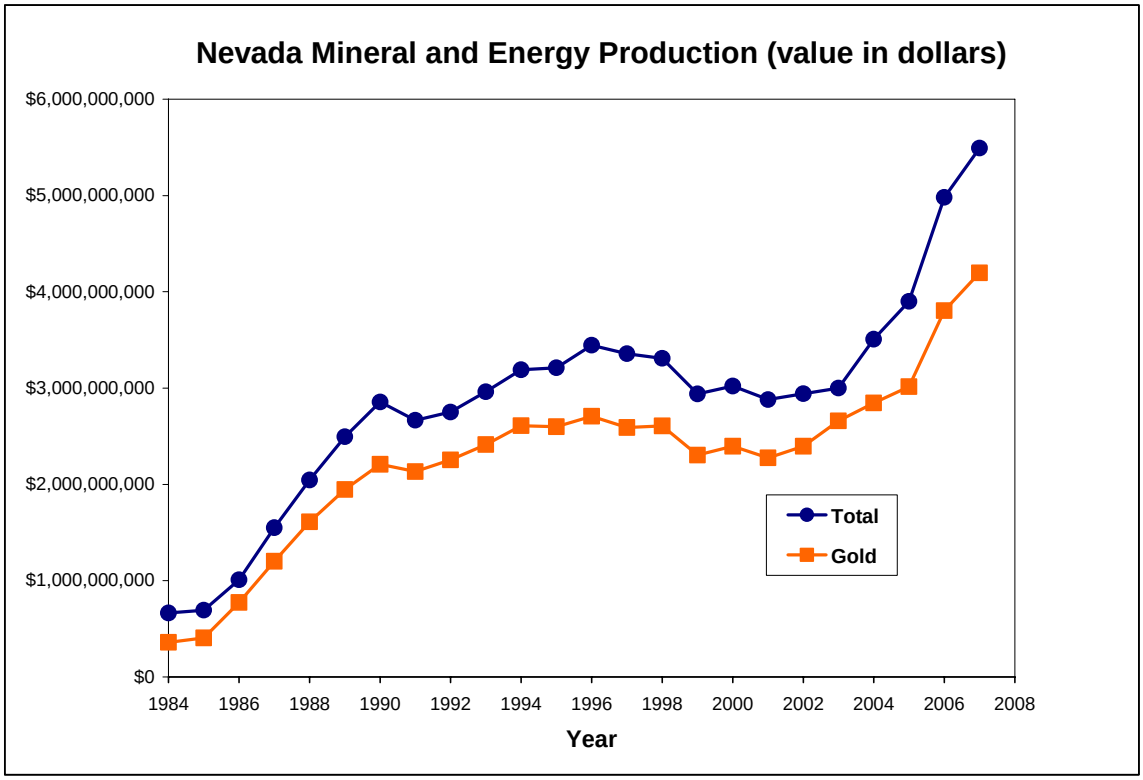
Another activity that relates to economic development is the storage of records and rock and ore samples from various locations throughout the state. These are exceptionally valuable, in some cases practically irreplaceable, samples needed in exploration for mineral, oil and gas, geothermal, and groundwater resources. Through regulations of the Commission on Minerals Resources and the Division of Minerals, NBMG stores cuttings, core, and paper records from oil and gas and geothermal wells drilled in Nevada. NBMG also stores selected, representative samples of ores and typical rocks from active and inactive metal and industrial mineral mines.

We are pleased to report that Phase I of the Great Basin Science Sample and Records Library is under construction. Funded by the U.S. Department of Energy in federal fiscal year 2006 at a level of $3.465 million, Phase I covers construction of approximately 10,000 square feet of a building that initially was planned to have a footprint of 15,000 square feet. With Phase I, we will have an excellent, functioning facility. We have proposed Phase II at a level of $5,000,000 to complete construction of the originally planned facility and to undertake a three-year effort to capture digital data and acquire critical physical samples. The new building is on the Reno campus of the Desert Research Institute, which shares in the need for this type of facility. Construction began in the spring of 2008, and we will be moving a small portion of the NBMG staff—our current NBMG publication sales and information office—into the new building. Customers should find parking more convenient than on the University of Nevada, Reno campus.

An exciting area for NBMG has been the move toward making information available free online. We do not see the end of the era of paper maps and reports, but we do see tremendous benefits to an expanding array of users who get information on the Web. Thanks in large part to a generous donation from Mrs. Ann Burgess, the Jay A. Carpenter Fund was established in honor of her grandfather, former Director of the Nevada Bureau of Mines and Geology. This donation is being used to help convert large maps and other documents in the NBMG Information Office files into digital formats for posting on the Web. The information helps stimulate exploration for mineral and energy resources and is useful in a wide array of environmental and public safety applications.

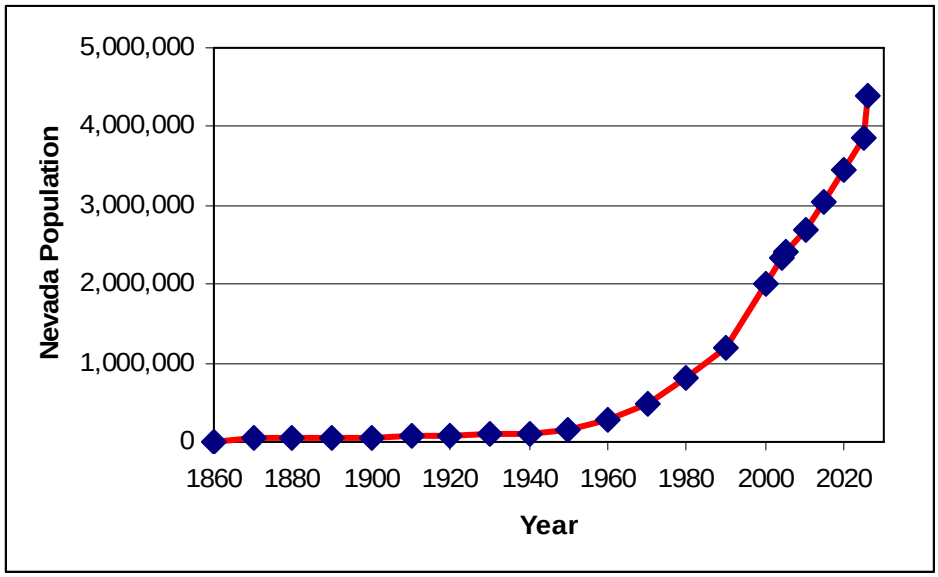
We are in the midst of the biggest gold-mining boom in American history. Nevada accounts for approximately 80% of current annual production of gold in the United States and 8% of the world production. Value of mineral production in Nevada reached a record of nearly $5.5 billion in 2007. (Data are from NBMG, the Nevada Division of Minerals, and the U.S. Geological Survey.) The high price of gold has resulted in vigorous exploration activity, which should help sustain the boom in Nevada for at least 20 more years.



## Addressing Nevada's Critical Needs - Natural Hazards and Economic Stability

NBMG's urban-area geologic hazard investigations, particularly studies of earthquake hazards, land subsidence and ground cracks due to groundwater withdrawal, and flash-flood hazards, help all businesses be better prepared for natural disasters. Nevada's gaming economy would suffer greatly if we were not able to rapidly recover from a major disaster, such as an urban earthquake. NBMG goes well beyond the identification of geologic hazards on maps and in technical reports; we also publish planning scenarios for major disasters and a series of maps, pamphlets, brochures, and Web pages geared toward the general public. As an example, since its publication in 1996, NBMG Special Publication 20 (*Planning Scenario for a Major Earthquake in Western Nevada*) has been used repeatedly in emergency management, response and recovery exercises, and planning by local, state, and federal officials. The probability of a magnitude 6 or greater earthquake occurring in the Reno-Carson City area within the next 50 years is significant, approximately 65 to 70%. A major earthquake would likely cause billions of dollars in damage and economic loss. Another major disaster for which we can be better prepared is flooding on alluvial fans. As Nevada's population has grown, much of the development has moved onto alluvial fans, unfortunately not always with full knowledge of the flash-flood hazards. Geologic mapping and careful evaluation of the frequencies and extents of past floods seen in the geologic record are critical to reducing the risks from these hazards.




Nevada's population will continue to rise. This will place demands on geological and other natural resources and heighten concerns regarding risks from natural hazards and environmental issues, particularly in urban areas. (Data are from the U.S. Census Bureau; the projection to 2026 is from the Nevada State Demographer.)

## Addressing Nevada's Critical Needs - Education and Services for the Public

NBMG produces many scientific publications that are used in schools. A part-time, only partially state-funded effort at NBMG is dedicated to getting these materials in the hands of teachers. Sometimes the materials are translated to formats that are more useful in the classroom, including posting them on the Web. NBMG staff members have been involved in the writing of the Nevada and National Science Education Standards, and we produce standards-based content material that can be used in schools. NBMG staff members regularly participate in the highly effective and popular teacher-education workshops that are sponsored by the Nevada Mining Association and jointly supported by the Nevada

Division of Minerals. In addition, NBMG staff members help coordinate field trips and other activities for the public and for K-12 teachers and students during Earth Science Week (second full week of October) and Earthquake Awareness and Preparedness Week (late February or early March), and staff scientists often judge science fairs. NBMG also produces some publications specifically for the general public, such as our popular field guides on the geology and natural history of the Las Vegas, Reno-Carson City-Lake Tahoe regions, and U.S. Highway 50. A similar book on U.S. Highway 93 is in the final stages of preparation, and long-term plans include books for Highways 95 and 6 and Interstate 80.

NBMG has direct contact with the public through several venues, including thousands of customers each year visiting its Publication Sales Office and its Information Office (open Monday through Friday), participation in exhibitions, Earth Science Week, Earthquake Awareness and Preparedness Week, and lectures at local schools and civic organizations. Frequently, professional staff members assist individual citizens with issues related to their personal property, such as location of groundwater wells, septic systems, faults, or soil stability. Increasingly, NBMG is reaching more of the public through its Web sites. Because many products that NBMG produces are heavily used by geological and engineering professionals, NBMG staff also make good efforts to participate in activities of the geological and professional organizations in the state, particularly the Geological Society of Nevada, Nevada Petroleum Society, Geothermal Resources Council, and local meetings of the Association of Environmental and Engineering Geologists, American Institute of Professional Geologists, and Society for Mining, Metallurgy, and Exploration.

The following table provides some measures of workload in sales of publications (according to NRS 514.070), analytical services (according to NRS 396.600), and numbers of customers served by the NBMG Information Office and by NBMG scientists.

| Year | Publication Sales[1] | Analytical Services | Information Office Customers Served[3] | | |
|---|---|---|---|---|---|
| | | | Walk-in | Telephone[2] | E-mail |
| 1998 | $134,987 | $20,655 | 1,067 | 1,423 | 142 |
| 1999 | 128,816 | 15,843 | 1,166 | 1,555 | 139 |
| 2000 | 160,240 | 15,116 | 1,051 | 1,401 | 232 |
| 2001 | 150,143 | 41,181 | 1,002 | 1,336 | 459 |
| 2002 | 130,675 | 65,399 | 905 | 1,204 | 271 |
| 2003 | 151,321 | 27,910 | 857 | 1,140 | 257 |
| 2004 | 152,452 | 37,925 | 788 | 1,049 | 271 |
| 2005 | 128,212 | 28,956 | 1,036 | 1,374 | 311 |
| 2006 | 185,296 | 30,830 | 804 | 1,069 | 241 |
| 2007 | 121,743 | 49,219 | 605 | 805 | 181 |

[1] These figures include sales of NBMG maps, bulletins, reports, electronic files on discs, and photocopies of open-file reports, topographic maps, and related items. The figures are updated from the last report using NBMG records.
[2] Counts of walk-in customers and e-mail inquiries are kept; telephone inquiries are estimated to be about four for every three walk-in customers. Records of numbers of informational inquiries directed to individual scientists are not kept; these are estimated to be approximately 550 per year.
[3] Numbers do not reflect customers who are increasingly serving themselves through the NBMG Web sites.

NBMG has developed a user-friendly site for the sale of publications on the Web (at www.nbmg.unr.edu/sales.htm). Considerable information for students, teachers, the general public, and technical professionals is available for free on the Web. Many publications, including most new geologic maps and reports, are available in their entirety on the Web, and nearly all the non-copyrighted, unpublished items (reports, maps, etc.) in the NBMG Information Office are now on the Web. NBMG does not make a profit on its publication sales; revenues generated from the sales go into a revolving fund that helps pay for the production, printing, and sales of future maps and reports.

## ACTIVE PROJECTS IN 2006 AND 2007

The following is a list of active projects at the Nevada Bureau of Mines and Geology (NBMG). Titles of funded projects are listed, followed in parentheses by the names of the principal investigators and other key scientists. The projects are funded by a variety of federal, state, and local agencies and the private sector. Although many individual projects listed below will result in maps, reports and other publications with multiple uses, the projects are listed in this table by their intended primary applications. Please note that geologic maps and most projects in basic science that underpins applications generally have many uses; the typical geologic map in Nevada has applications in earthquake, flood, and land-surface stability hazards; mineral and water resources; and environmental protection. As publications are released, they will be posted on the NBMG Web site (www.nbmg.unr.edu) or, for external publications in the scientific literature, listed in the next NBMG Biennial Report (also available on the NBMG Web site). Feel free to contact the NBMG principal investigators to find out more about the status of these projects.

### URBAN GROWTH - NATURAL HAZARDS AND ECONOMIC STABILITY

- **Earthquakes**

Determination of Fault Slip Rates, Paleoearthquake History, and Segmentation of the Warm Springs Valley Fault System
(Craig dePolo and Alan Ramelli)

Earthquake Risk Mitigation in Nevada
(Craig dePolo, Jon Price, John Anderson, and Diane dePolo, Nevada Seismological Laboratory)

Earthquake Scenarios for Each County Seat in Nevada
(Ron Hess, Craig dePolo, Christine Arritt, Jordan Hastings, and Jon Price)

Estimating Seismic Hazard in the Basin and Range Province Using Horizontal GPS Data: Collaborative Research between the University of Nevada, Reno and the USGS
(Bill Hammond and Corné Kreemer)

Estimating Uncertainties of Seismic Hazard Parameters for Nevada Faults, Formation of a Nevada Quaternary Fault Working Group, and Gaining Consensus Fault Parameters
(Craig dePolo)

Geologic Mapping of the Grimes Point Quadrangle
(John Bell and Kyle House)

Geologic Mapping of the Lahontan Mountains Quadrangle
(John Bell and Kyle House)

Geologic Mapping of the Seven Lakes Mountain Quadrangle
(Chris Henry, Alan Ramelli, and Jim Faulds)

InSAR across the Sierra Nevada—Basin and Range Transition Zone
(John Bell and Gary Oppliger, Department of Geological Sciences and Engineering)

Liquefaction Susceptibility Mapping in Carson Valley, West-Central Nevada
(Craig dePolo and Alan Ramelli)

Mogul Earthquake Sequence
(Craig dePolo)

Nevada Earthquake Response GPS Network (NEARNET)
(Geoff Blewitt, Bill Hammond, Corné Kreemer, and Hans-Peter Plag)

Paleoseismic Studies of the Little Valley Fault
(Alan Ramelli)

Quaternary Faulting and Seismic Source Characterization in the Las Vegas Metropolitan Area
(Craig dePolo and colleagues at UNLV)

Quaternary Fault Map of Nevada
(Craig dePolo)

Slip Rate of the Mohawk Fault Zone
(Corné Kreemer and Bill Hammond)
Structural Controls in the Northwest Great Basin
(Jim Faulds)
Studies of the Solid Earth's Deformation Induced by the Sumatra Earthquake and Tsunami
(Geoff Blewitt, Hans-Peter Plag, Bill Hammond, and Corné Kreemer)
Upgrade and Enhancement of HAZUS Nevada Fault Database
(Craig dePolo and Ron Hess)
Vigilant Guard Earthquake Exercise
(Diane dePolo, Nevada Seismological Laboratory, Jon Price, and Craig dePolo)
Wells Earthquake
(Craig dePolo, Chris Henry, John Bell, Alan Ramelli, Jon Price, and colleagues from the Nevada Seismological Laboratory, U.S. Geological Survey, and Utah Geological Survey)

- **Floods**

Geologic Mapping of the Spirit Mountain NW Quadrangle, Clark County
(Kyle House and Jim Faulds)
Geologic Mapping Along the Walker River between Weber Dam and Walker Lake
(Kyle House and Ken Adams, Desert Research Institute)
Impact of Extrafluvial Events on River Valley Evolution, Owyhee River, Oregon
(Kyle House, L. Ely, Central Washington University, and L. Safran, LCC)
Surficial Geologic Mapping and Piedmont Flood Hazard Assessment in the Ivanpah Valley I-15 Corridor, Clark County, Nevada
(Kyle House, Alan Ramelli, and John Bell)
Virgin River Flood Hazard Mapping
(Kyle House)

- **Subsidence and Fissures due to Groundwater Withdrawal**

Detection of Horizontal Displacements Associated with Heavy Groundwater Pumping in Las Vegas, Nevada
(John Bell and Falk Amelung, University of Miami)
Development and Transfer of InSAR and GPS Applications to Local Government in Nevada
(John Bell and Geoff Blewitt)
InSAR-based Aquifer Deformation Maps for Subsiding Groundwater Basins in Southern Nevada
(John Bell and Falk Amelung, University of Miami)
InSAR Research in the Boulder Valley Area
(John Bell)
InSAR Studies in the Diamond-Kobeh Valley Area
(John Bell)
Operation and Analysis of Subsidence Data from a Continuous GPS Station in Las Vegas Valley
(John Bell)
Subsidence Studies in the Pumpernickel-Kelly Creek Basin Area and Other Mining Areas
(John Bell)

- **All Hazards**

Development of Real-Time Tsunami Warning Systems Using Continuous GPS
(Geoff Blewitt, Bill Hammond, Corné Kreemer, and Hans-Peter Plag)
Nevada Hazard Mitigation Planning Committee
(Jon Price)
Risk Assessment Updates for the State of Nevada Multi-Hazard Mitigation Plan
(Jon Price; Jeff Underwood, Department of Geography; Ron Hess, and Jordan Hastings)

System Design for a GPS Component of Real-Time Earthquake Source Determination and Tsunami Warning Systems
(Geoff Blewitt; Bill Hammond; Corné Kreemer; and Hans-Peter Plag; Seth Stein and Emile Okal, Northwestern University)
Update of the HAZUS-MH Loss-Estimation Modeling Data for Nevada
(Christine Arritt and Gary Johnson)
Update of the Nevada State Hazard Mitigation Plan
(D.D. LaPointe and Jon Price)

## MINERAL, ENERGY, AND WATER RESOURCES VITAL TO ECONOMIC EXPANSION

- **Precious and Base Metals**

Characterization of the Time-Space Relationships between Hydrothermal Alteration, Gold Mineralization, and Intrusive Phases in the RBM Pit, Bald Mountain Mining District, White Pine County, Nevada
(John Muntean)
Debunking Mining Fraud
(Paul Lechler)
Eocene Magmatism, Tectonics, and Carlin-Type Deposits
(Chris Henry)
Fluid Pathways, and Metal Transport and Deposition in Carlin-Type Gold Deposits: Insights From the Getchell System
(John Muntean and Jean Cline, UNLV)
Geologic Mapping of the Flowery Peak Quadrangle
(Steve Castor and Kyle House)
Geologic Mapping of the Olinghouse Quadrangle
(Larry Garside)
Geologic Mapping of the Virginia City Quadrangle
(Steve Castor, Larry Garside, Chris Henry, and Don Hudson, consultant)
Geology and Gold Deposits of the Jerritt Canyon District
(John Muntean and Chris Henry)
Geology of the Caetano Caldera and its Relationship with the Ore Deposits near Cortez
(Chris Henry; David John and Joe Colgan, U.S. Geological Survey)
Geology of the Searchlight District and Geologic Mapping of the Searchlight Quadrangle
(Jim Faulds, Alan Ramelli, and John Bell)
Mining Cooperative Fund Research
(Jon Price)
Recovery of Platinum and Palladium from Fortified Fire Assay Charges of Quartz and Gabbro
(Paul Lechler)
Significant Mineral Deposits of Nevada, Compilation and Revision of the U.S. Geological Survey's Database
(D.D. LaPointe)
Standard Reference Materials for Precious Metal Analysis
(Paul Lechler and Mario Desilets)
Turquoise Ridge Gold Deposit
(John Muntean)
Zonation of Hydrothermal Alteration around the High-Grade Gold Veins in the Jarbidge Mining District
(John Muntean)

- **Industrial Minerals, including Construction Raw Materials**

Geologic Mapping in the Fernley East Quadrangle
(Jim Faulds, Alan Ramelli, and John Bell)

Mineral-Resource Evaluation of Southern Nevada Areas of Critical Environmental Concern
(Steve Castor)

Mineral Resources of the Reno 30x60-Minute Quadrangle
(David Davis and Larry Garside)

Origin of World-Class Celestite Deposits in the Sivas Basin, Central Turkey
(Paul Lechler and colleagues at Cumhuriyet University)

- **Geothermal Energy and Other Forms of Renewable Energy**

Characterization of Active Faulting and Neotectonics at Nevada Geothermal Sites
(John Bell and Alan Ramelli)

Characterizing Structural Controls on Geothermal Systems in the Northwestern Great Basin through Integrated Geologic and Geophysical Analyses
(Jim Faulds; Gary Oppliger, Department of Geological Sciences and Engineering; and Mark Coolbaugh, Great Basin Center for Geothermal Energy)

Crustal Strain-State Analysis through Deep Electrical Anisotropy Mapping: An Alternative Tool for Identifying the Orientation of Critically Stressed Fractures for Enhanced Geothermal Systems
(Corné Kreemer; Gary Oppliger, Department of Geological Sciences and Engineering; and Mark Coolbaugh, Great Basin Center for Geothermal Energy)

Developing a Conceptual Structural Model for the Blue Mountain Geothermal Field, Humboldt County
(Jim Faulds)

Expanding Geothermal Resource Utilization in Nevada through Directed Research and Public Outreach
(Lisa Shevenell)

Exploration for Concealed Structures at Desert Peak using Mercury Soil Gas Detectors
(Paul Lechler)

Exploratory Drilling Program to Evaluate the Lifetime and Current Potential of the Humboldt House Geothermal System, Pershing County, Nevada
(Gina Tempel, Department of Geological Sciences and Engineering; Lisa Shevenell; Richard Ellis, A. Waibel, and John Barta)

Geochemical Sampling of Thermal and Non-thermal Waters in Nevada: Evaluation of Geothermal Resources for Electrical Power Generation and Direct-use Applications
(Lisa Shevenell; Larry Garside; Paul Lechler; and Mark Coolbaugh, Great Basin Center for Geothermal Energy)

Geographic Information Systems Support to the State's Renewable Energy Transmission Advisory Committee
(Jordan Hastings)

Geologic and Geophysical Analysis of the Desert Peak-Brady Geothermal Fields
(Jim Faulds; Gary Oppliger, Department of Geological Sciences and Engineering; and Larry Garside)

Geothermal Applications of Multi-Gas Geochemistry
(Paul Lechler; Larry Garside; Lisa Shevenell; and Mark Coolbaugh, Great Basin Center for Geothermal Energy)

Geothermal Assessment of Pyramid Lake Paiute Reservation Lands
(Lisa Shevenell; Mark Coolbaugh, Great Basin Center for Geothermal Energy; and Gary Oppliger, Department of Geological Sciences and Engineering; Jim Faulds; Wendy Calvin, Department of Geological Sciences and Engineering; and John Louie, Nevada Seismological Laboratory)

Geothermal Resources in Nevada, Map 141 (Third Edition)
(Lisa Shevenell)
Geothermal Spring Sampling
(Lisa Shevenell; Larry Garside; Paul Lechler; and Mark Coolbaugh, Great Basin Center for Geothermal Energy)
Mercury Soil-Gas Detectors
(Paul Lechler)
Nevada Geothermal Resources Database and Web Site
(Lisa Shevenell and Larry Garside)
Nevada Geothermal Technical Advisory Panel
(Lisa Shevenell, Jim Faulds, and Larry Garside)
Pattern and Timing of Active Faulting along Nevada Geothermal Systems: Is There a Connection?
(John Bell and Alan Ramelli)
Regional Assessment of Exploration Potential for Geothermal Systems in the Great Basin Using a Geographic Information System (GIS)
(Mark Coolbaugh, Great Basin Center for Geothermal Energy; Gary Raines, U.S. Geological Survey; Lisa Shevenell; Alex Minor, University of Nevada, Reno Computing Services; Don Sawatzky, Gary Oppliger, and Jim Taranik, Department of Geological Sciences and Engineering)
Revival of Grass-Roots Geothermal Exploration in the Great Basin (Where to Look for New Geothermal Fields) -- A New Approach to Assessing Geothermal Potential Using a Geographic Information System
(Mark Coolbaugh and Rick Zehner, Great Basin Center for Geothermal Energy; Corné Kreemer; Don Sawatzky, Gary Oppliger, and Jim Taranik, Department of Geological Sciences and Engineering; Dave Blackwell, Southern Methodist University; Lisa Shevenell; and Gary Raines, U.S. Geological Survey)
Satellite Interferometric Synthetic Aperture Radar (InSAR) Ground Displacement Analysis for Geothermal Reservoir Management and Development
(Gary Oppliger, Department of Geological Sciences and Engineering; Mark Coolbaugh, Great Basin Center for Geothermal Energy; and Lisa Shevenell)
Targeting Potential Geothermal Resources in the Great Basin Using Regional Relationships Between Geodetic Strain and Geological Structures
(Geoff Blewitt, Corné Kreemer, and Bill Hammond)

- **Petroleum**

Nevada Petroleum Potential
(Larry Garside)

- **Uranium**

Geology of the McDermitt Caldera Complex
(Chris Henry and Steve Castor)
Database on Nevada Uranium and Thorium Resources
(Larry Garside and David Davis)

## ENVIRONMENTAL CONCERNS

- **Mercury and Other Chemical Hazards from Historical Mining and Natural Sources**

Gases Associated with Geothermal Activity at the Redfield Campus, Steamboat Geothermal System
(Paul Lechler)

- **Global Change**

  Appraisal of Relative Sea-Level Rise Scenarios for Venice
  (Hans-Peter Plag, Geoff Blewitt, and Bill Hammond, with help from an international team of experts)

  Sequestration of Carbon Dioxide using Mafic and Ultramafic Rocks
  (Jon Price, Daniel Sturmer, D.D. LaPointe, and Ron Hess)

  Sequestration of Carbon Dioxide in Nevada Oil Fields
  (Jon Price, D.D. LaPointe, and Ron Hess)

  Studies of Local to Global Mass Movements on the Earth's Surface, Including Sea Level Changes
  (Hans-Peter Plag)

  Surface Mass Loads from GRACE, GPS, and Earth Rotation Measures
  (Hans-Peter Plag and Geoff Blewitt)

- **Nuclear Waste**

  Geodetic Monitoring of the Yucca Mountain Region using Continuous Global Positioning System Measurements
  (Jon Price; Geoff Blewitt; Hans-Peter Plag; Corné Kreemer; Bill Hammond; Brian Wernicke, California Institute of Technology; and James Davis, Harvard-Smithsonian Center for Astrophysics)

- **Riparian Restoration**

  Ecosystem Flow Recommendation Study, Bill Williams River, Arizona
  (Kyle House)

**SCIENCE TO UNDERPIN THE APPLICATIONS**

- **Geologic Framework – With Applications in Resources, Hazards, and Environment**

  Clark County Geologic Mapping Program
  (Jim Faulds, Kyle House, Alan Ramelli, Craig dePolo, and Larry Garside)

  Conversion of Geologic Maps into Geographic Information Systems
  (Jordan Hastings, Gary Johnson, Heather Armeno, and Liz Crouse)

  Geologic Mapping in the Lahontan Mountain Quadrangle
  (John Bell and Kyle House)

- **Tectonics**

  An Integrated Geologic and Geodetic Study of Strain Accumulation and Release in the Northern Walker Lane
  (Steve Wesnousky, Department of Geological Sciences and Engineering; Bill Hammond; and Corné Kreemer)

  Geologic Mapping of the Fernley West Quadrangle
  (Jim Faulds, Alan Ramelli, John Bell, and Chris Henry)

  Geologic Mapping of the West Half of the Hazen Quadrangle
  (Jim Faulds and Alan Ramelli)

  Geologic Mapping of the Stockton Flat Well Quadrangle
  (Chris Henry; Alan Ramelli; and Dave Boden, Truckee Meadows Community College)

  Neogene Development of the Northern Walker Lane: An Evolving Transform Plate Boundary
  (Jim Faulds; Chris Henry; and Pat Cashman, Department of Geological Sciences and Engineering)

  Paleogene Paleovalleys in Nevada and Eastern California
  (Larry Garside, Chris Henry, and Jim Faulds)

Quasi-Block Modeling of Walker Lane Belt Tectonic Deformation, Using Geodetic and Geologic Data to Constrain System Complexity and Time-Variable Behavior
(Bill Hammond, Geoff Blewitt, and Corné Kreemer)
Tertiary-Quaternary Magmatic-Tectonic-Hydrothermal Evolution, Central Nevada to the Sierra Nevada
(Chris Henry)
Temporal and Spatial Changes of Stress and Strain
(Corné Kreemer with colleagues Oliver Heidbach and Anke Friedrich)

- **Global Geodesy**

Earth's Shape, Geoid, Rheology, and Water Storage
(Geoff Blewitt)
Global Geodetic Observing System: Meeting the Requirements of a Global Society on a Changing Planet in 2020
(Hans-Peter Plag)
Improvements to the GPS Data Analysis System as Implemented at JPL
(Geoff Blewitt)
National Geodetic Infrastructure: Status Today and Future Requirements
(Hans-Peter Plag)
Synthesis of NASA Data on Earth's Changing Geometrical and Gravitational Shapes to Assess Change in Terrestrial Water Storage and its Effect on Sea Level, Lithospheric Loading, and Earth Rotation, and to Image Mantle Rheology
(Geoff Blewitt)
Terrestrial Reference Frame Theory and Practice for Solid Earth and Global Change Research
(Geoff Blewitt)
Workshops to Establish a Stable North America Reference Frame for EarthScope
(Geoff Blewitt)

- **Other Earth Processes**

Elucidating Physical Processes in Upper Crustal Magma Systems - Evidence from Miocene Intrusive and Extrusive Sequences in Southern Nevada
(Jim Faulds)
Initiation of the Yellowstone Hotspot: Silicic Magmatism in Northwestern Nevada and Southeastern Oregon
(Chris Henry)

## EARTH SCIENCE EDUCATION AND OUTREACH TO THE PUBLIC

- **Outreach to the General Public, K-12 Teachers, and Students**

EarthCache and GeoCache Sites in Nevada
(D.D. LaPointe and Jon Price)
Earth Science Week Field Trips for the Public
(D.D. LaPointe and Jon Price)
Educational Supplies for Teachers
(D.D. LaPointe)
Nevada Earth/Space Science Initiative
(D.D. LaPointe and colleagues in the College of Education, Department of Physics, and Washoe County School District)
Teachers Workshops Sponsored by the Nevada Mining Association
(D.D. LaPointe and Jon Price)

Traveling the Great Basin Highway: A Guide to the Geology and Natural History along U.S. Highway 93 in Nevada and Arizona
(Jon Price, Joe Tingley, and Kris Pizarro)

- **Outreach to Professionals**

Georeferencing the Nevada Bureau of Mines and Geology's Information Office Files
(Ron Hess, Gary Johnson, Dick Meeuwig, and Jon Price)
Great Basin Science Sample and Records Library (new building to house geoscience samples, publications, and information)
(Jon Price)
Inventory of Geologic Data and Information
(David Davis)
Inventorying Sample Collections from Nevada
(Ron Hess and David Davis)
Organizing Core and Cuttings
(David Davis and Jon Price)

## BUDGET

Nearly half of the funds expended by NBMG come from the Legislature as part of the Statewide Program funding for the University of Nevada, Reno. The bulk of these funds cover salaries and fringe benefits for NBMG employees. The state does not provide a substantial amount of operating funds ($46,635 per year in recent years), and the amount of money normally required to be returned for mandated salary savings is approximately equal to the total amount of operating funds. This results in little operating funds at the beginning of any fiscal year, unless someone is on sabbatical leave or there is a vacancy. In part because the workforce is quite stable and few employees leave before retirement, and because other employees cannot always fill in when vacancies do occur, this forces NBMG to seek external funds from a variety of grants and contracts to help pay for the essential work. Fortunately there are a number of opportunities for cost sharing with federal, state, and local agencies, such that generating sufficient external research funds has not been a large problem. Seeking grants and contracts is a significant duty of the Director and of many of the senior staff. The University provides support through its Office of Sponsored Projects Administration. The University also provides overhead support for NBMG, which covers such items as electricity, heat, building maintenance, human resources, and financial reporting. Grants and contracts secured by NBMG employees typically cover the indirect costs (including these overhead expenses) associated with those additional activities.

The fiscal crisis affecting the state and world economy has had a significant impact on NBMG's ability to do its work, although core missions are still covered. In February 2008, the University instructed NBMG to cut $200,000 from its biennial budget for fiscal years 2007-2009. This was accomplished through the retirement of our editor and Webmaster at the end of March 2008, removing two graduate research assistantships from our budget, and not spending salary savings from the phased in retirement of one of our senior geologists. This resulted in savings of $32,970 in fiscal year 2007-2008 and $167,030 in fiscal year 2008-2009. The cuts to the editor/Webmaster position and graduate research assistantships resulted in permanent cuts to NBMG's base budget of $100,000 per year. Fortunately, we were not required to cover additional mandated salary savings in the current fiscal year. In December 2008, the University further instructed NBMG to permanently cut an additional $140,000 from its base budget for fiscal year 2009-2010. We anticipate taking these cuts from classified support-staff positions, with the hope that some of the necessary support functions can be covered with grants and contracts that are secured by NBMG's state-funded professional staff.

| State-funded budget item | Fiscal Year 2007-2008 budget | Current Fiscal Year 2008-2009 budget | Projected Fiscal Year 2009-2010 budget |
|---|---|---|---|
| Professional | $1,275,229 | $1,478,839 | $1,354,799 |
| Classified | 507,180 | 482,634 | 344,784 |
| Graduate Assistants | 28,000 | 0 | 0 |
| Fringe Benefits | 471,130 | 396,921 | 518,811 |
| Operating | 46,635 | 46,635 | 46,635 |
| Funds that would have been allocated but were rescinded | - | 167,030 | - |
| Subtotal, beginning budget | 2,328,174 | 2,572,059 | 2,265,029 |
| Funds rescinded | -32,970 | -167,030 | - |
| Subtotal | 2,292,204 | 2,405,029 | 2,265,029 |
| - Mandated Salary Savings | -45,000 | - | -45,223 |
| Total | $2,247,204 | $2,405,029 | $2,219,806 |

## STAFFING LEVELS AND CHANGES

As of July 1, 2008, NBMG had 12.62 full-time equivalent (FTE) faculty (professional) positions, 8.81 classified staff FTE, and two half-time graduate research assistants funded by the state. An additional 6.38 faculty FTE, one research associate/scientist, 8.72 classified staff FTE, and generally between 5 and 15 undergraduate and graduate student assistants were covered by various grants and contracts, mostly from federal and local agencies plus some from state agencies and the private sector. Wages are competitive with those at comparable universities, and we have been able to attract a staff with excellent national and international scientific reputations. Turnover has been at an acceptable level; some, but few, staff members have left before retirement.

We wish **Christine Arritt**, cartographer and GIS expert, well in her work as a geologist with a local engineering consulting firm. While employed as a classified staff member, NBMG supported Christine in her pursuit of a master's degree in geological engineering at the University of Nevada, Reno.

In the state budget cuts, we lost the two graduate research assistantships, which had been supervised by new, untenured faculty. A research assistantship for a new faculty hire was a strong tool for recruiting the best scientists to the University. With the retirement of **Dr. Richard Meeuwig**, we have transferred his editorial functions to the NBMG scientific staff and his Webmaster tasks to the cartographic support staff. The loss of Dick's position is a setback for NBMG because the editorial work detracts from scientific research and outreach activities of our scientific staff. Dick was outstandingly efficient in his management of NBMG's Website, with its necessary complications for publication sales and its large amounts of digital offerings through our Information Office.

We welcome the addition of **Dr. Jordan Hastings** to the NBMG staff. As our Chief Cartographer and GIS Manager, Jordan leads our team of cartographers, graphic artists, and GIS experts, who support the preparation of NBMG maps and other publications, and who assist in the creation of graphics for various presentations made by NBMG scientists. Jordan replaced **Elizabeth Crouse**, whom we wish well in her new job with a local mineral-exploration company.

A list of current NBMG staff, divided by major areas of responsibility and annotated with principal areas of expertise, is given on the next page.

## Staff of the Nevada Bureau of Mines and Geology

**Jonathan G. Price, Ph.D., State Geologist and Director** - management, mineral deposits, & geochemistry

### Scientific Research Staff

#### Economic Geology, Geologic Mapping, and Geologic Framework

Stephen B. Castor, Ph.D., Research Geologist - mineral deposits & mineralogy
James E. Faulds, Ph.D., Research Geologist - structural geology, tectonics, & paleomagnetism
Nicholas Hinz, M.S., Research Geologist – geologic mapping & structural geology
Larry J. Garside, M.S., Research Geologist - volcanic stratigraphy & energy resources
Christopher D. Henry, Ph.D., Research Geologist - volcanic stratigraphy & geochronology
John Muntean, Ph.D., Research Economic Geologist/Assistant Research Professor – metallic mineral deposits

#### Geologic Hazards, Engineering Geology, and Geophysics

John W. Bell, M.S., Research Professor - Quaternary stratigraphy, engineering & urban geology
Geoffrey Blewitt, Ph.D., Research Professor - geodesy & geodynamics
Craig M. dePolo, Ph.D., Research Geologist - earthquake geology & neotectonics
William Hammond, Ph.D., Assistant Research Professor – geodesy & geodynamics
P. Kyle House, Ph.D., Research Geologist - fluvial geomorphology & paleohydrology
Heather Green, B.S., Research Assistant - geomorphology
Corné Kreemer, Ph.D., Assistant Research Professor – geodesy & geodynamics
Hans-Peter Plag, Ph.D., Research Professor – geodesy & geodynamics
Alan R. Ramelli, M.S., Research Geologist - neotectonics & Quaternary stratigraphy

#### Environmental Geology and Hydrogeology

Paul J. Lechler, Ph.D., Chief Chemist/Geochemist - analytical geochemistry & precious metals
Lisa Shevenell, Ph.D., Research Hydrogeologist - hydrogeology & geothermal resources
Robin Penfield, M.S., Staff Research Associate I - geochemistry

#### Science Education

Daphne D. LaPointe, M.S., Research Geologist - science education & mineral deposits

### Support Staff

#### Cartography and Publications Support

Jordan Hastings, Ph.D., Chief Cartographer and GIS Manager – GIS & cartography
Heather Armeno, B.S., Cartographer – cartography & GIS
Shelley Delaureal, B.A., Cartographer – cartography & graphic design
Linda D. Goar, Accounting Assistant II – project accounting & administration
Jack Hursh, Jr., B.S., Cartographer – graphic design & publication design
Gary Johnson, Information Systems Specialist - GIS & systems administration
Jennifer Mauldin, B.A., Cartographer – cartography, graphic design, & publication design
Kris R. Pizarro, Cartographic Supervisor - cartography, graphic drafting, & publication design
Matthew Richardson, B.S., Cartographer – cartography & GIS

#### Analytical Laboratory

Paul J. Lechler, Ph.D., Chief Chemist/Geochemist - analytical geochemistry & precious metals
Mario Desilets, M.S., Chemist and Quality Assurance Officer - analytical geochemistry

#### Information and Publication Sales

Ron Hess, M.S., Chief Information Officer - GIS, remote sensing, & systems administration
David Cornett, B.A., Supply Assistant – publication sales & information office support
David Davis, M.S., Geologic Information Specialist - Nevada geology & mining history
Martha Henson, B.A., Administrative Assistant II – document scanning & publication sales backup
Bret Pecoraro, Development Technician II - technical support on field projects and in the Information Office
Charlotte Stock, M.S., Sales Manager - publication sales

#### Administration

Terri M. Garside, Program Officer I - finance, contract management, & administration
Monique Smith, Administrative Assistant II - administration

Although the state budget cuts have seriously impacted NBMG's ability to respond to the breadth of needs for geological information and research in Nevada, we anticipate being able to preserve the faculty positions that will be created with the retirements of **Larry Garside** and **Dr. Steve Castor**. Larry and Steve have been key members of NBMG's geological research staff. Both have authored numerous geologic maps, contributed to our understanding of mineral deposits, and served the geological profession in Nevada with distinction. We expect to be able to use the salary savings from their vacancies to hire researchers who will build programs in the important areas of mineral and energy resources and hazards.

## RELATIONS WITH OTHER AGENCIES

There are no alternate providers of NBMG services. NBMG works closely with several other state agencies and with some federal and local agencies, but in all cases the programs of these agencies are complementary with those of NBMG and are not overlapping. The U.S. Geological Survey (USGS) also produces geologic maps, but their priorities are established by federal needs. NBMG works closely with the USGS through the State's Mining Cooperative Fund (see NRS 514.060 and NRS 519A.260), the National Cooperative Geologic Mapping Program (see 43 USC Sec. 31c), and, along with the Federal Emergency Management Agency and the Nevada Division of Emergency Management, the National Earthquake Hazards Reduction Program.

NBMG also works closely with the Nevada Division of Minerals. The Division of Minerals regulates drilling operations of oil, gas, and geothermal wells; administers a program to identify, rank, and secure dangerous conditions at abandoned mines; and manages the state reclamation performance bond pool. NBMG does none of these activities, but our programs are complementary. NBMG co-produces with the Division of Minerals annual mineral and energy production statistics, and we jointly support educational efforts regarding mineral and energy resources. We also have worked together on projects with the Western Governors Association regarding issues of abandoned mines. NBMG's role is in scientific research and related scientific data collection. NBMG also archives and makes available to the public records and samples collected from oil, gas, and geothermal wells regulated by the Division of Minerals (according to NAC 522 and NAC 534A).

NBMG's participation in several statewide bodies helps insure that there is no unnecessary duplication of services or efforts. The Nevada Earthquake Safety Council and the Nevada Hazard Mitigation Planning Committee include representatives from a wide range of state and local governmental agencies, nonprofit groups, and the private sector; NBMG's participation in these groups helps to coordinate efforts. In the case of the Nevada Earthquake Safety Council and in areas of earthquake research, NBMG works closely with the Nevada Seismological Laboratory, another Statewide Program in the Mackay School of Earth Science and Engineering at the University of Nevada, Reno. Whereas the Laboratory covers earthquake hazards largely from a seismic monitoring and research perspective, NBMG's expertise is in earthquake geology (neotectonics), geodesy, geodynamics, structural geology, and tectonics. In addition, NBMG has an advisory committee that includes representatives of several organizations with which we interact regularly.

NBMG works with the W.M. Keck Earth Science and Mineral EngineeringMuseum at the Mackay School of Earth Sciences and Engineering to further the collection of geological and mineralogical specimens and with the DeLaMare Library to improve the collection of published and unpublished information on the geology and mineral resources of the state (see NRS 514.040).

## CONTRIBUTIONS TO THE EDUCATIONAL MISSION OF THE UNIVERSITY

NBMG is a major UNR research unit (with both applied and basic research funded by a wide array of federal, state, and local agencies and the private sector). Through support of graduate and undergraduate research assistantships and service as faculty advisors of graduate students, NBMG faculty members are enriching the educational experience of UNR students. Many graduate and undergraduate students gain practical experience through work on NBMG projects. NBMG normally employs approximately six graduate research assistants (supervised by NBMG faculty and financially supported on their research grants) and ten undergraduate student assistants (some in research-support positions, including learning skills in geographic information systems and geology; some in support of our analytical chemistry laboratory; some in support of our administrative duties; and some in support of our information and publication sales office). In the FY'08 round of budget cuts, NBMG lost the only two state-funded graduate research assistantships it had. Students are now entirely funded on non-state funds.

NBMG scientists often volunteer to help with university classes. Although not primarily responsible for teaching, some NBMG faculty and one of its classified staff members teach University courses on a fairly regular basis, generally in the Department of Geological Sciences and Engineering and in the Geography Department, and frequently lecture in courses in those and other University departments. In an effort to become better integrated with the teaching departments and expand opportunities for our faculty and the students, we are finalizing a memorandum of understanding with the departments in the Mackay School of Earth Sciences and Engineering. Most NBMG faculty members are members of the UNR Graduate Faculty through the Department of Geological Sciences and Engineering. Several NBMG faculty members also participate in UNR's interdisciplinary Hydrological Sciences graduate program. As a Statewide Program, with numerous research projects in southern Nevada, NBMG scientists also collaborate with colleagues in the Geoscience Department at UNLV. This involves research, support of UNLV graduate students and postdoctoral scholars, and lecturing, particularly on topics of interest in southern Nevada.

NBMG faculty are also engaged in the governance of the University through service on various college and university committees and the Faculty Senate. They have the same rights and responsibilities as instructional faculty and tend to be heavily involved in outreach to communities throughout Nevada and to professional organizations.

NBMG recently arranged for the donation, from Stanford University to UNR, of a significant collection of thousands of samples from ore deposits throughout the world. These samples are being used in teaching and research in economic geology, extractive metallurgy, and mining engineering at the Mackay School of Earth Sciences and Engineering. The renamed Mackay-Stanford Ore Deposits Collection helps bolster Mackay's reputation as a leading institution in research on ore deposits and as a premier university for the education of professionals in mineral-resource fields. Global demand for mineral and energy resources has risen dramatically in recent years and has created high demand for professionals in industry, government, and academia. The collection is located in Room 5B of the Scrugham Engineering-Mines Building on the northeast corner of the UNR quad (the first floor of NBMG's building), where it will get maximum use by students and researchers. Access to the collection will be managed by the W.M. Keck Earth Science and Mineral Engineering Museum.

NBMG scientists add greatly to the reputation of the University. We have several award-winning scholars and international leaders in their specialties, particularly in the fields of geodesy, economic geology, and engineering geology. We publish routinely and broadly in the peer-reviewed literature, significantly expanding the exposure of UNR scholars. We generate a major portion of the external funding within the geosciences at UNR, making UNR one of the leading universities in the country in terms of external geoscience funding. We are the only university in the country that has both the state geological survey and a seismological laboratory along with a teaching department in geological sciences.

## GOALS AND OBJECTIVES

From discussions that have been ongoing over the last several years, NBMG has developed the following goals and objectives for the next five to ten years.

### Earth-Science Research

Our goal is **to improve the quality of life of Nevada citizens by conducting applied and basic earth-science research that encourages economic development; minimizes losses to lives, property, and businesses from natural disasters; and protects the environment.** We strive to anticipate issues, such as new areas for urban growth and new waves of mineral exploration, before they arise. NBMG's research productivity is measured in terms of publications and grants. Other measures include recognition from peers, such as honors and awards from scientific and professional organizations. In recent years, NBMG has become an important contributor to the University's grant and contract acquisition, mainly from governmental funds. We have also developed research programs that are supported by private industry. In addition to applied research, NBMG recognizes the need for basic research in earth sciences, particularly in Nevada, and our research objectives include both types of work. Part of this goal is to maintain high levels of significant research publications, including ones released by NBMG and ones in the broader scientific literature.

Specific objectives under this goal include the following:

- Accelerate the construction and completion of fully reviewed, published **geologic maps**. Geologic maps at various scales are needed to support mineral- and energy-resource exploration and assessment, research on natural hazards, water-resource investigations, environmental work, and fundamental science. With total costs to adequately map a quadrangle being on the order of $150,000 each, the task is enormous. Nonetheless, by setting priorities with the help of the State Mapping Advisory Committee and other governmental and private groups, our goal is to continue to map, and to support mapping by others, in the highest priority areas. The ultimate objective of our geologic mapping efforts is to cover the entire state with detailed, generally 1:24,000-scale, geologic maps. Publishing five new geologic maps per year would be a laudable accomplishment for a geological survey of our size.

- Expand programs to reduce risks from **natural hazards**, particularly earthquakes and floods, in urban and rural communities in Nevada. The compilation and public communication of information on geologic and environmental hazards in Nevada, particularly in metropolitan areas but also in small communities and rural areas, is an important responsibility. Although we have accomplished much, our goal is to do even more in the following areas: earthquake hazards, flood and landslide dangers, land subsidence and other engineering-construction problems, groundwater resources, and natural and human-induced geochemical hazards. Assistance in emergency planning and mitigation efforts in these areas is an important part of this responsibility. We expect to work closely with local governments in these efforts.

- Expand programs in **natural resources**. As mandated by the Nevada Legislature, NBMG intends to continue to provide information on the natural resources needed to sustain a well-diversified state economy. This includes research in economic geology for assessment and environmentally sound development of **metal and industrial mineral resources** in Nevada. Mining of metals and industrial minerals has been, and will continue to be, important to Nevada. Participation in the development of wise land-use decisions involving natural resources is part of this objective. We also plan to expand programs in **water quality and resources**, particularly as related to geological factors, such as natural contamination from mineralized areas and structural controls on the flow of groundwater. We are developing new programs in **energy resources**, with the intent of helping Nevada to be more secure in its

production of electricity and other uses of energy. A NBMG faculty member, Dr. Lisa Shevenell, is the Director of the Great Basin Center for Geothermal Energy at the University of Nevada, Reno. Research funded through this center is stimulating geothermal exploration and development in Nevada and nearby states. Opportunities exist for more NBMG involvement in assessing wind, solar, uranium, oil, and gas resources and for conducting research on these resources. Our objective is to supply, in collaboration with other governmental agencies and industry, the information that is needed to develop these resources in environmentally and economically responsible ways.

- Develop **management structures for support staff** that facilitate improved service to NBMG researchers and the public. With funding from grants, in recent years we have added support staff in two areas: (a) cartography/GIS and (b) information and publication sales. Dr. Jordan Hastings supervises the cartographic and GIS support staff, and Ron Hess supervises the information and sales office staff. Unfortunately, the budget cuts have resulted in reducing state funds for the support staff. We hope, but are not assured, that we will be able to cover the needed support staff with new grants and contracts. Moving our information and publication sales offices together into a new building will lead to workload efficiencies and new opportunities for external funding.

- Develop **project and program teams** that facilitate building of NBMG research programs, creating opportunities for funding, and being prepared to respond to emerging issues. Our geodesy team, now with four professional positions, one technician, and several collaborators within and outside NBMG, is likely to continue to expand in response to exciting scientific opportunities and applications in GPS and InSAR.

**Geological Information and Long-Term Data Preservation Plan**

Our goal is to make information regarding geological issues in Nevada available to the public via the Internet and other means. We want to assure that the State of Nevada is adequately integrating geographic and geologic information into policy decisions and government programs. To assist in this effort, our objective is to develop a digital information office and work closely with the University of Nevada, Reno library, federal agencies, local and state agencies, and the Geographic Information Systems Subcommittee of the State Mapping Advisory Committee to provide easily accessible, publicly available digital products. The digital products should be free and easily found on the Web.

The paper files in our information office and NBMG publications are progressively being converted to digital format. With funding assistance from private donations and the Commission on Mineral Mineral Resources/Nevada Division of Minerals, and with funds allocated by the state to the Nevada Bureau of Mines and Geology, we have made good progress on digitizing the maps and one-of-a-kind reports in our Jay A. Carpenter Mining District Files. In 2008, we released digital scans of electrical logs from oil and gas exploration and production wells to the public, and scanning of selected aerial photographs is underway. Our long-term plan is to scan all NBMG publications and non-copyrighted documents in our open files and make digital copies freely available to the public on the Web. Anticipating changing computer technologies, we have established a fund from private donations ($25,000 endowment generating income of approximately $1,250 per year) that will allow us to migrate the digital files to new formats and hardware when needed.

NBMG works closely with the W.M. Keck Earth Science and Mineral Engineering Museum (also part of the Mackay School of Earth Sciences and Engineering) to build and maintain useful sample collections. The museum focuses on museum-quality specimens for display and research, while NBMG focuses on samples that are used in exploration for and assessment of energy, mineral, and water resources, geologic hazard assessment, environmental protection, and geoscience research. The NBMG collections include samples from petroleum and geothermal wells (which we are required by state regulations to curate), mineral deposits, characteristic altered and unaltered rocks from Nevada mining districts, and samples

collected during NBMG geologic mapping and research projects. Samples are currently housed in four locations—the museum on the University campus, the first floor of NBMG's offices on the University campus, two small sheds on the east side of the campus, and in storage containers on University land in the town of Stead, approximately 10 miles north of campus.

There is currently a tremendous opportunity to preserve geoscience data and sample collections. These data and samples, which have been collected at the cost of hundreds of millions of dollars by local, state, and federal agencies and the private sector in Nevada alone, have many applications for the public good. Among the applications most relevant to Nevadans are:

- assessment of groundwater resources and water-quality protection;
- minimization of environmental impacts from land disturbance;
- economic development and land management in areas of potential mineral and energy resource extraction and urban growth;
- evaluation of natural hazards, particularly earthquakes, landslides, and floods;
- long-term monitoring of waste disposal sites and ground impacted by nuclear explosions; and
- improvement of the scientific knowledge of Earth processes and expansion of research opportunities.

The need for space and facilities to house critical geoscience data and samples is a national issue. The National Research Council highlighted the problem in its 2002 report on *Geoscience Collections and Data: National Resources in Peril*. Congress authorized the National Geoscience Data Preservation Program Act as part of the Energy Policy Act of 2005. As the state agency authorized by the Legislature to curate geoscience collections and data, NBMG is eligible to be a part of the national data archive system. With funding provided by Congress through the U.S. Department of Energy, NBMG is in the process of building a new facility (the Great Basin Science Sample and Records Library) to house its sample collections and manage its digital records. The facility, to be completed early in 2009, will be staffed by NBMG employees who currently run our combined information and publication sales office. It will include approximately 6,000 square feet of two-story storage racks for physical samples; approximately 4,000 square feet of examination rooms, information office space for customers, space for scanning, and space for publication sales; and approximately 2,000 square feet of unfinished second-floor publication storage space.

NBMG is cooperating with the U.S. Geological Survey as it develops the national catalog of archived materials under the National Geological and Geophysical Data Preservation Program. We anticipate that the national catalog will provide a portal for many people to find the digital files and physical samples that are archived by NBMG and other state geological surveys.

Our long-term data preservation plan includes the following elements:

1. Complete scanning of all NBMG publications, including open-file reports (currently, many are awaiting going out of print before being put in the queue for scanning).
2. Eliminate our backlogs in accessioning paper records (geological and mineral-resource reports) donated to NBMG by consulting geologists and companies by scanning these items and entering metadata on them into the national catalog, then encourage additional donations of exploration drilling results; geologic, geochemical, and geophysical maps; geological reports, etc.
3. Eliminate our backlog in accessioning physical samples (core and cuttings donated to NBMG by companies and rock and other geoscience samples from NBMG and other University research projects) by properly boxing, indexing, shelving, and creating metadata for the national catalog.
4. Update mineral-resource databases for use by decision makers.
5. Scan remaining oil and gas well logs in Nevada.
6. Acquire sufficient computer-storage media for digital aerial photographs and mining-district files.
7. Build interactive Web-based maps with data on mineral and energy resources and related

geographic data used in land-management decisions.

8. Design and implement a Web-based reporting system for exploration results.
9. Solicit new physical samples from mineral deposits (particularly representative samples from closing mines) and research collections, along with location maps and related information to be scanned and entered into the national catalog. Samples from today's mines should be preserved for study during the next exploration and mining booms.
10. Scan microfiche files and archived photos and slides.
11. Convert scanned written information (currently in tiff and pdf files) through optical character-recognition software into fully searchable text files, and make the information available free on the Web.
12. Migrate digital files and metadata to new software and hardware to assure that no data are lost and that users from the general public have easy access.
13. Expand the Great Basin Science Sample and Records Library with Phase II, an additional 5,000 square feet of sample-storage area plus finishing off the second-floor storage area for paper publications.
14. Build or convert existing buildings into sample and records libraries in two other locations in Nevada—near Elko, the center of the gold-mining industry, and in southern Nevada.

Significant progress will be made on many of these elements with existing NBMG funds, innovative partnerships with the private sector (particularly in sharing electronic data and information), and partnerships with local, state, and federal agencies. Our estimate of the additional cost for geoscience data preservation in Nevada, including Phase II of the Great Basin Science Sample and Records Library and two new facilities, is $18.7 million.

| | |
|---|---|
| Phase II of the facility in Reno (adding 5,000 square feet, two-stories high) | $ 2.2 million |
| Cost of digital data capture and selective acquisition of samples | |
| from key localities throughout the state, $2.8 million for first 3 years; | $ 2.8 million |
| plus $2 million per year for each of the following two years | $ 4.0 million |
| Facility on Nevada System of Higher Education land in or near Elko | $ 5.7 million |
| Facility on Nye County or federal land in southern Nevada | $ 4.0 million |
| TOTAL needs for Geoscience Collections and Data Preservation in Nevada | $18.7 million. |

If sufficient funding were available, we could complete the entire effort in five years. We work with the Advisory Committee of NBMG, which has representatives from the private sector and local, state, and federal agencies, to explore opportunities for funding.

The estimate for the facility in southern Nevada is the additional cost for 12,000 square feet to be added to a building that Nye County is considering in discussions with the Department of Energy. The County anticipates that the Department of Energy will pay for the curation of samples from the Yucca Mountain Project. The additional 12,000 square feet would handle space for samples from the Nevada Test Site and from other parts of southern Nevada and adjoining states, and this would include approximately 1,000 square feet of heated and air conditioned work space and 2,000 square feet of storage space for the Nevada Seismological Laboratory, whose seismic network is partially supported by funding from the Department of Energy.

Annual operating costs for these facilities are a challenge. Currently, NBMG invests approximately $265,000 per year in personnel and operating expenses for its Information and Publication Sales offices, which will become part of the Reno facility. We anticipate the following additional needs:

| | |
|---|---|
| Reno facility | $ 50,000 |
| Elko facility | $100,000 |
| Southern Nevada facility | $100,000+ |
| SUBTOTAL, Additional annual operating costs | $250,000+/year |

The overall costs to operate the southern Nevada facility would be substantially more, if sample-management costs for the Nevada Test Site and Yucca Mountain are included. The $100,000 per year

figure would cover the non-Department of Energy samples.

**Earth-Science Education**

Our goal is **to translate scientific information to help the public make informed decisions regarding resources, hazards, and the environment.** NBMG has had a long tradition of providing earth-science information to not only the geological and engineering communities but also to K-12 teachers, students, and the general public. In addition, we have participated with the University of Nevada, Reno Department of Geological Sciences and Engineering and external geoscience organizations in offering short courses for continuing education of professionals. Our objective is to expand our programs in educational outreach. We will continue to work with the W.M. Keck Earth Science Mineral and Engineering Museum, the Nevada Mining Association, the Geological Society of Nevada, the Nevada Earthquake Safety Council, and the American Geological Institute's Earth Science Week in our K-12 and general public outreach efforts.

## STRATEGIES TO REACH THESE GOALS AND OBJECTIVES

**Creating and Responding to Opportunities**

We expect to expand geoscience research in Nevada through a combination of creating opportunities and responding to emerging and existing opportunities. We create new programs by working with local, state, and federal agencies, and some private companies, that have needs and interests that mesh with our expertise in such areas as geologic mapping, natural hazards, natural resources, and environmental concerns. The fact that approximately 87 percent of the land in Nevada is managed by federal agencies requires that we work closely with these agencies to structure programs of mutual benefit to the State of Nevada and the federal government. We will also continue to work closely with state and local agencies that have complementary missions and interests.

The substantial costs of digital data capture and selective acquisition of samples are patterned after similar efforts in Alaska, which were supported by federal funds. We anticipate that funds will come from federal agencies with needs for preserving data from federally managed lands in Nevada and from state agencies that share our interests in preserving the samples and data. We may also be able to cover some operating expenses with private donations for endowments, user fees, arrangements with volunteer organizations, and grants.

NBMG’s scientists will continue to seek funding for basic and applied research through competitive programs in a number of federal agencies. We have been particularly successful with such programs in the U.S. Department of Energy, the National Aeronautics and Space Administration, the National Science Foundation, and the U.S. Geological Survey. We expect to continue that success. As new opportunities arise within these and other agencies, we will respond within our constraints of available staff.

**Increase Staff in Critical Areas**

Meeting many of the goals and objectives outlined above will require adding new faculty and/or support staff in the classified ranks. We think it appropriate for the University and Board of Regents to ask for some of these additions to come from state funds. Two to five new state-funded positions per biennium would be realistic when we emerge from the current recession. With the budget cuts that were implemented in 2008 and the plans for cuts in 2009, we anticipate beginning fiscal year 2010 with four fewer state-funded FTE than we had at the beginning of fiscal year 2008.

NBMG's level of staffing is not adequate to meet all the demands that we have for geologic maps and applied geologic research. NBMG could more effectively carry out its mission with the addition of

several new positions in both research faculty and support staff. Specifically, we have immediate needs for additional staff in the following technical (both scientific and support) areas:

framework geology (2 FTE) – the pending retirements of Steve Castor and Larry Garside will leave NBMG with a staff no longer able to cover key areas of bedrock geology, economic geology, stratigraphy, structural geology, and tectonics; these are all key aspects of NBMG's mission; we see large needs for expertise in the geology of southern and eastern Nevada, including areas with potentials for oil and gas, mineral, and water resources; a position could be stationed in Las Vegas, in which case additional operating funds for a Las Vegas office would be needed;

earthquake geology and neotectonics (1 FTE or full-time-equivalent position) – to assure continuity in NBMG's highly successful efforts in earthquake preparedness, including outreach to the public and non-geoscience professionals; this position would interface closely with the Nevada Seismological Laboratory; currently most of the activity in this area is supported by grants and contracts; more work is needed in both southern and northern Nevada;

geodesy and geodynamics (2 FTE) – to further build expertise in the exciting areas of geodynamics and space geodesy, which has wide applications in geological hazards and weather; these positions would also work closely with the Nevada Seismological Laboratory;

scientific editing (0.5 FTE) – the budget cuts in 2008 resulted in the loss of NBMG's editor; burdening our geological staff with the task of editing NBMG publications detracts from their normal scientific productivity; our workload is such that a half-time editor is needed.

information systems and Web offerings (1.5 FTE) – the budget cuts in 2008 also resulted in losing our key Web supporter, who spent half time as Webmaster and half time as editor; we have transferred the Web functions to other classified support staff, but doing so has decreased productivity in our cartography and GIS support areas; we see expanding needs for database management that will integrate Web offerings with NBMG reports and maps as they are prepared for final publication;

outreach specialist and science education (0.69 FTE) – to dedicate a full position to the important function of translating applied research for more immediate use by the public;

geologic information, marketing, and publication sales (0.51 FTE) – to better reach the public with NBMG's useful publications; this would make the NBMG publication sales clerk a full-time, state-funded position; this is needed because the duties of the sales clerk are evolving into more of a geologic information specialist, helping customers find the generally free materials that they need;

geochemistry and petrology (1 FTE) – to better understand the magmatic history of Nevada, particularly as it relates to the abundant gold, silver, copper, iron, molybdenum, zinc, and other metallic mineral deposits;

management assistant or managing editor (1 FTE) – to assist with non-technical tasks in support of the cartography of geologic maps, graphic design, layout, and other aspects of publication preparation; this position is currently covered with grants, but we are struggling to keep it funded because grants normally cannot directly cover many administrative functions;

grants management (2 FTE) – to free up time for scientists to devote to applied research rather than spending as much time as we currently do with research-proposal generation, budgeting, monitoring, and contract reporting;

geologic mapping, with an emphasis on geothermal and hydrothermal systems (1 FTE) – to better assess mineral and geothermal resource potentials;

laboratory and field assistant (1 FTE) – to assist in geothermal, geodetic, and other field and laboratory research efforts; we have covered this position with grants and contracts; state support in this area would make us more competitive for opportunities that require matching funds with federal agencies;

hydrogeology, with an emphasis on transport modeling, evaporation, and recharge (1 FTE) – to link with geological investigations that will help protect existing groundwater resources and find new ones;

geologic mapping, with an emphasis on Quaternary and Tertiary stratigraphy (2 FTE) – to stay ahead of expanding urban development, particularly in southern Nevada;
geological and geotechnical engineering (1 FTE) – to deal with urban-area geological hazards;
remote sensing (1 FTE) – to assist in the next generation of geologic, mineralogical, and lithologic mapping and in emerging technologies;
cartography (1 FTE) – to stay not far behind the cutting edge of technological developments in computer-aided drafting and map production; the current staff is highly productive but stretched to the limit;
geophysics, with an emphasis on gravity and electromagnetic techniques (1 FTE) – to better model the three-dimensional structures in Nevada's complicated geology;
geophysics, with an emphasis on reflection seismic techniques (1 FTE) – to better image specific areas of interest, such as petroleum fields, major ore-deposit trends, and alluvial basins that supply most of the groundwater resources in the state;
geochronology, with emphasis on isotopic and paleontological approaches (2 FTE) – to assist geologic mappers and other researchers with unraveling geological histories; and
limnology (1 FTE) – to study how the chemistry and habitat-supporting characteristics of natural lakes and man-made lakes (particularly pit lakes from mining) will change over time.

Setting priorities for positions and for filling of vacancies as they occur is an ongoing process with input from NBMG staff, the NBMG Advisory Committee, University administrators, and representatives of local, state, and federal agencies and the private sector who have good ideas regarding needs and opportunities for applied geological research. The full needs outlined above would add 25.2 FTE to NBMG's staff; this would about double the number of positions at NBMG. Ideally, some of the new positions would be located in Las Vegas, where issues of urban growth are creating large demands for geologic maps and applied research. Appropriate operational, travel, communications, and facilities costs would need to be added along with the increases in FTE.

NBMG currently has an efficient supervisory structure. The Director directly supervises 15 scientists who are faculty members, two administrative faculty members, and three of the fourteen classified staff members. The remaining 15 classified staff members, one faculty member, and several graduate and undergraduate students are supervised by others. As staff expands, additional supervisory responsibilities would need to be assumed by the Director or by other scientists and support staff members.

We recognize that major additions of research faculty and research-support staff are likely to come from soft money. An important strategy for increasing research activities is to keep attuned to opportunities for research funding from all major sources, including federal, state, and local agencies, industry, and private foundations. We will continue to do so.

## OUTCOME-RELATED PERFORMANCE MEASURES FOR NBMG

### Research Productivity

Reports, maps, and special publications produced by NBMG, including articles published in scientific journals and elsewhere by the NBMG staff, serve as the best performance indicators. These publications are the chief products of research. Other measures that could be used, such as the numbers of presentations made about NBMG research or the number of research grants or dollars received for research grants and contracts, are proxies for research productivity. Yearly totals of numbers of publications are not necessarily an ideal measure, however, because with a small staff, the workload can vary considerably from year to year as large projects start and finish. Therefore, averages over a number of years are better measures.

### Reports, Bulletins, Open-File Reports, and Other Publications of NBMG

| Year | Geologic Maps | Yearly Totals[1] | Average (of past three years) | Number of scientists[2] | Average number of NBMG publications per scientist per year |
|---|---|---|---|---|---|
| 1991 | 0 | 15 | | 11 | |
| 1992 | 2 | 20 | | 11 | |
| 1993 | 7 | 16 | 17 | 11 | 1.5 |
| 1994 | 4 | 12 | 16 | 11 | 1.5 |
| 1995 | 6 | 18 | 15 | 11 | 1.4 |
| 1996 | 3 | 16 | 15 | 11 | 1.4 |
| 1997 | 4 | 14 | 16 | 11 | 1.5 |
| 1998 | 5 | 26 | 19 | 11 | 1.7 |
| 1999 | 21 | 40 | 27 | 11 | 2.4 |
| 2000 | 8 | 25 | 30 | 11 | 2.8 |
| 2001 | 10 | 24 | 30 | 11 | 2.7 |
| 2002 | 3 | 17 | 22 | 11 | 2.0 |
| 2003 | 26 | 53 | 31 | 11 | 2.8 |
| 2004 | 8 | 30 | 33 | 11 | 3.0 |
| 2005 | 13 | 29 | 37 | 11 | 3.4 |
| 2006 | 15 | 37 | 32 | 11 | 2.9 |
| 2007 | 3 | 12 | 26 | 11 | 2.4 |

[1] Numbers of NBMG publications, including geologic maps, produced during that year.
[2] The number of NBMG scientists supported on grants and contracts rose from three (from 1991 to 2003) to six (from 2003 to 2006) to seven (2007 to present). In recent years the number of state-funded scientists has been steady at eleven.

### External Publications Produced by NBMG Scientists

| Year | Yearly Totals | Average (of past three years) | Number of scientists | Average number of external publications produced per scientist per year |
|---|---|---|---|---|
| 1991 | 52 | | 11 | |
| 1992 | 52 | | 11 | |
| 1993 | 49 | 51 | 11 | 4.6 |
| 1994 | 72 | 58 | 11 | 5.2 |
| 1995 | 54 | 58 | 11 | 5.3 |
| 1996 | 66 | 64 | 11 | 5.8 |
| 1997 | 76 | 65 | 11 | 5.9 |
| 1998 | 91 | 78 | 11 | 7.1 |
| 1999 | 75 | 81 | 11 | 7.3 |
| 2000 | 72 | 79 | 11 | 7.2 |
| 2001 | 56 | 68 | 11 | 6.2 |

| | | | | |
|---|---|---|---|---|
| 2002 | 63 | 64 | 11 | 5.8 |
| 2003 | 70 | 63 | 11 | 5.7 |
| 2004 | 88 | 74 | 11 | 6.7 |
| 2005 | 91 | 83 | 11 | 7.5 |
| 2006 | 105 | 95 | 11 | 8.6 |
| 2007 | 111 | 102 | 11 | 9.3 |

**Overall Productivity (Total number of publications per state-funded scientist)**

| | Average of past three years | Average number of publications (NBMG and external) produced per state-funded scientist per year |
|---|---|---|
| 1993 | 68 | 6.2 |
| 1994 | 74 | 6.7 |
| 1995 | 74 | 6.7 |
| 1996 | 79 | 7.2 |
| 1997 | 81 | 7.4 |
| 1998 | 96 | 8.8 |
| 1999 | 107 | 9.8 |
| 2000 | 110 | 10.0 |
| 2001 | 97 | 8.6 |
| 2002 | 86 | 7.8 |
| 2003 | 94 | 8.6 |
| 2004 | 107 | 9.7 |
| 2005 | 120 | 10.9 |
| 2006 | 142 | 12.9 |
| 2007 | 123 | 11.2 |

With only 17 full-time scientists on the NBMG staff during 2006 and 18 in 2007 (only 11 of whom were funded by state appropriations), NBMG has been highly productive. Measured on a per-person basis, publication productivity is outstanding. The rise in recent years is in part the result of adding additional scientists supported on grants and contracts.

These measures of publication productivity allow quantitative comparisons over time and with other organizations, but they don't necessarily indicate the quality of the publications or their applicability to issues in Nevada and beyond. The fact that NBMG scientists are publishing in a broad array of leading, peer-reviewed scientific journals demonstrates the quality of the scientific work; in the last two years, these journals have included *Applied Geochemistry; Bulletin of the Seismological Society of America; Earth, Planets and Space; Economic Geology; Environmental and Engineering Geoscience; Environmental Geology; Geological Society of America Special Paper; Geological Society, London Special Publication; Geology; Geophysical Journal International; Geophysical Research Letters; Geothermal Resources Council Bulletin; International Geology Review; Journal of Hydrology; Journal of Geodynamics; Journal of Geophysical Research; Philosophical Transactions of the Royal Society of London;* and *Seismological Research Letters.* In addition, NBMG scientists contribute frequently to applied science publications, such as the *Geothermal Resources Council Transactions* and the symposium proceedings of the Geological Society of Nevada, and to news in professional and trade journals, including *Mining Engineering*, *Geotimes*, the *SEG Newsletter*, *GSA Today*, and *The Professional Geologist*.

NBMG's flagship publications (geologic maps, reports, and bulletins) undergo generally as rigorous a peer review as the refereed journals (more so in the case of geologic maps). A few anecdotal statements from users of NBMG maps and other reports demonstrate some of the applicability of NBMG work.

Alan R. Coyner, Administrator of the Nevada Division of Minerals, in a letter dated 18 October 2006, wrote:

> "The NBMG geologic mapping efforts have been encouraged by a broad group of constituents, including county governments and other state agencies, regional water and flood-control districts, the USGS, the BLM, and the Pyramid Lake Paiute Tribe."

Ronald L. Parratt, President and CEO of AuEx Ventures, Inc., in an e-mail dated 22 October 2007, stated:

> "I strongly endorse the geological mapping program conducted by the Nevada Bureau of Mines and Geology. Fundamental geologic mapping is critical to Nevada in many ways including earthquake hazards evaluation, flood issues, urban planning and development of natural resources such as aggregates and precious metals. These maps have been and will continue to be used daily by government and industry professionals."

Steven A. Fechner, Mineral Team Leader for the U.S. Forest Service, stated in an e-mail dated 19 October 2007:

> "The USDA Forest Service strongly endorses the Nevada Bureau of Mines and Geology (NBMG) mapping programs. The priorities that are outlined by the NBMG will greatly aid in accomplishing the mission of the Forest Service in Nevada. Of note are the studies in the Walker River, which will aid in accomplishing Forest Service fish studies in the drainage; the digitizing of geologic maps, the products which are used by Forest Service planners, geologists, and biologists in analyzing existing and desired conditions and in processing mineral permits; and geologic mapping around the urban interfaces in southern and northern Nevada, where much of the public land is in the National Forest system."

Gary Johnson, Deputy State Director for Minerals, U.S. Bureau of Land Management, in an e-mail dated 22 October 2007, wrote:

> "In the management of Federal lands for mineral development, geologic mapping projects are extremely valuable and useful. The BLM utilizes this information from "cradle to grave" in allowing development of mineral resources in an environmentally responsible way. These (GIS conversions) are extremely important and useful to BLM."

Del Fortner, President, Western Resources Group, LLC, in an e-mail dated 22 October 2006, stated:

> "In my experience it is most important for public and private enterprise to have the most up-to-date geologic information. For industry and government to find common ground they must speak from the same qualified scientific point of view. The USGS funding for the STATEMAP portion of the National Cooperative Geologic Mapping Program is essential to government and industry. The priorities for geologic mapping projects in Nevada are cooperatively identified by industry, government and academia through the Geologic Mapping Subcommittee hosted by the Nevada Bureau of Mines and Geology."

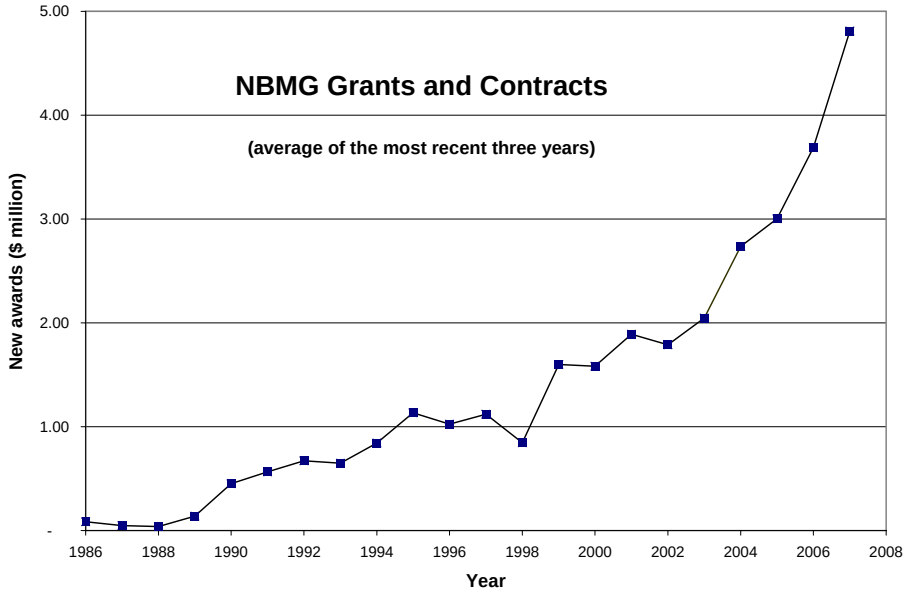
Michel Houseman, Chief Geologist with World Minerals Inc., in a letter received on 8 October 2007, stated:

> "World Minerals is aware of a proposal to map portions of the Hazen Quadrangle in the coming year and we would like to encourage the NBMG to fully fund and support this mapping program. The Hazen Quadrangle is one of the State of Nevada's most significant diatomite producing areas, and hosts operating mines owned by the two largest diatomite producing companies in the world. Published maps and geologic reports of this area are woefully inadequate, and the geology is quite complex. A comprehensive mapping program could provide the data necessary for the discover and development of new diatomite deposits. World Minerals hopes that NBMG elects to proceed with this project as it could provide a valuable contribution towards understanding an important industrial mineral producing district."

Debra W. Struhsacker, Environmental Permitting and Government Relations Consultant, in an e-mail dated 22 October 2007, wrote:

> "Geologic information in the form of reliable maps and cross sections are critical to policy makers (i.e., regulators and elected officials) charged with making sound and informed decisions about numerous important matters including but not limited to the following:
>
> - how buildings should be designed to withstand earthquakes;
> - where development should not occur in light of flood, landslides, and earthquake hazards;
> - emergency response planning to address the above-listed geologic hazards;
> - areas that should remain open to mineral exploration and development due to their mineral potential; and
> - environmental rules and regulations.
>
> I use geologic maps, like those that are available on the NV Bureau of Mines and Geology's website, on a regular basis in the course of my consulting work for mining industry clients."

To collect new geological information and conduct geological research, operating money is needed. These funds pay for such expenses as fieldwork, base maps, aerial photographs, research equipment, and chemical analyses of rocks. Grants and contracts also pay salaries of additional researchers and support staff. NBMG also uses some grant funds and some donations to the University of Nevada, Reno Foundation to pay geologists outside the University to submit geologic maps to NBMG for review and publication. Grants and contracts bring new money into the Nevada economy, and they expand the State's research capabilities and increase knowledge about Nevada's geology; mineral, energy, and water resources; natural hazards; and environment. NBMG continues to provide many vital public services to the state with the help of these grants and contracts. In addition, the fact that other agencies and organizations are willing to contribute money to support NBMG projects is a statement of the value and applicability of the work.



**Research and Non-Research Grants and Contracts Awarded**

| Year | Number of Grants and Contracts | Total Awards | Average (of past three years) |
|---|---|---|---|
| 1984 | 4 | $ 182,389 | |
| 1985 | 3 | 37,970 | |
| 1986 | 3 | 32,790 | $ 84,383 |
| 1987 | 3 | 74,450 | 48,403 |
| 1988 | 1 | 7,186 | 38,142 |
| 1989 | 7 | 337,658 | 139,765 |
| 1990 | 15 | 1,009,440 | 451,428 |
| 1991 | 4 | 351,298 | 566,132 |
| 1992 | 15 | 650,801 | 670,513 |
| 1993 | 23 | 944,687 | 648,929 |
| 1994 | 14 | 932,270 | 842,586 |
| 1995 | 32 | 1,529,343 | 1,135,433 |
| 1996 | 14 | 615,509 | 1,025,707 |
| 1997 | 17 | 1,215,298 | 1,120,050 |
| 1998 | 29 | 708,603 | 846,470 |
| 1999 | 32 | 2,873,711 | 1,599,204 |
| 2000 | 29 | 1,164,626 | 1,582,313 |
| 2001 | 25 | 1,630,994 | 1,889,777 |
| 2002 | 41 | 2,571,242 | 1,788,954 |
| 2003 | 22* | 1,936,308* | 2,046,181* |
| 2004 | 25* | 3,698,781* | 2,735,444* |
| 2005 | 19* | 3,373,403* | 3,002,831* |
| 2006 | 38* | 3,989,817* | 3,687,334* |
| 2007 | 27* | 7,066,919*# | 4,810,046*# |

* These numbers include projects of the Great Basin Center for Geothermal Energy, managed by NBMG scientists.
# These numbers include $3,465,000 for the Great Basin Science Sample and Records Library in 2007.

## Customer-Service Questionnaire

In January 2006, NBMG began distributing a questionnaire to patrons (see Appendix C). The quantitative results from 37 respondents from 1 July 2006 through 18 December 2008 are summarized below, using a standard grade-point average (where A = 4, B = 3, C = 2, D = 1, and F = 0). Also listed in parentheses is the percentage of respondents who listed a particular item as A.

**Overall Performance of the Nevada Bureau of Mines and Geology**

How well is the Nevada Bureau of Mines and Geology serving you? **3.26 (66% A)**

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**NBMG Publications and Information Office**

| | |
|---|---|
| Quality of NBMG publications | **3.15 (65% A)** |
| Usefulness of the publications | **3.42 (70% A)** |
| Number and variety of publications | **3.30 (58% A)** |
| Quality of NBMG geologic maps | **3.50 (75% A)** |
| Detail of NBMG geologic maps | **3.41 (69% A)** |
| Current coverage of geologic maps | **3.13 (50% A)** |
| Free publications on the Web | **2.91 (50% A)** |
| Cost of publications for sale | **3.09 (53% A)** |
| Customer service for sales | **3.21 (70% A)** |
| Ease of Web sales | **3.10 (53% A)** |

| | |
|---|---|
| Timeliness of receiving Web, mail, and fax orders | **3.11 (66% A)** |
| Service from Information Office | **3.38 (66% A)** |
| Air photo coverage | **2.93 (56% A)** |
| Content of mining district files | **3.22 (59% A)** |
| Free mining-district, geothermal, and other information on the Web | **3.12 (55% A)** |
| Hours of operation (currently M-F, 8:00 a.m. to 3 p.m.) | **2.68 (55% A)** |
| **External Publications and Professional Service** | |
| External publications | **3.07 (57% A)** |
| Professional service | **2.20 (24% A)** |
| **Outreach to the General Public, K-12 Teachers, and Students** | |
| Publications for the general public | **3.29 (61% A)** |
| Earth Science Week field trips | **3.31 (62% A)** |
| Helpfulness in answering questions | **3.23 (63% A)** |
| **Analytical Laboratory** | |
| Quality of assays | **3.15 (56% A)** |
| Cost of assays | **3.15 (53% A)** |
| Turnaround time | **3.00 (48% A)** |

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We feel that the results of the customer-service questionnaire are quite positive; the overall grade is between an A and B, and the majority of the respondents chose A for most areas. A few areas that stand out with less than a B average, and a few additional written comments, point to significant concerns, but we feel that our strategies are moving us in the right direction to address these concerns.

We are making progress toward offering nearly all NBMG publications free on the Web. With a few exceptions, including the popular geologic and natural history tour guides, most publications are designed for primary distribution free on the Web. As an example, the most recent version of our annual publication on the Nevada Mineral Industry, covering statistics for 2007, was designed for Web distribution, which allowed inclusion of color graphics that were too expensive to include in a large print run. Customers are welcome to print the pages that they need, and we continue to sell paper copies that are printed on demand, thereby reducing the need for printing and keeping a large inventory.

The hours of operation for our publication sales and information office are restricted because of budget limitations. We have only 1.49 sate-funded FTE dedicated to what are currently two offices – one for publication sales and one for geological information. We supplement this with soft-money staff and student hires, who are funded in part from sales revenues and in part from various grants and contracts related to information gathering and electronic capture. In the near future, when our information and publication sales offices are combined in the new Great Basin Science Sample and Records Library, we may be able to expand the hours of operation. In addition, our customers should be pleased with parking and access to the new building, on the campus of the Desert Research Institute rather than on the southern part of the University campus, where parking has become progressively more difficult to find with the construction of the Davidson Mathematics and Science Center.

Our collection of aerial photographs includes mostly public-sector photographs donated to us from the Nevada Department of Transportation and other agencies. These are frequently viewed by customers who are investigating the historical use of the land and by geologists who are mapping and studying details of the rocks. Our long-term plans include high-resolution scanning of all our air photos. Significant progress is being made in collaboration with a private company, which is scanning most of the urban-area photographs; these will be made publicly available two years after the company completes its work. A

similar arrangement has allowed us to scan and now post for free on the Web electronic copies of the logs from most of the oil and gas exploration and development wells drilled in Nevada.

Our lowest grade from customers who responded to the questionnaire was in service to the profession. Although we continue to support the local professional organizations, including the Geological Society of Nevada, Nevada Petroleum Society, and Nevada chapters of the American Institute of Professional Geologists, Association of Environmental and Engineering Geologists, and Society for Mining, Metallurgy, and Exploration, through lectures, volunteering for committee service, and leading field trips, we should strive to do more to support the professions of geology and related fields. Budget constraints have forced us to focus our efforts on research and public service programs for which others are willing to help cover some or all of the costs. The NBMG Director tries to monitor the pulse of the professional community by attending as many local meetings as possible and by encouraging other NBMG staff members to volunteer. One area in which we could do more is offering short courses for professionals in our areas of scientific expertise.

**Quality of the Research and Public Service Products**

NBMG faculty and some classified staff members are recognized within the state, regionally, nationally, and internationally for their contributions to science and society. Many of these contributions are listed in Appendix A, which provides some details of the activities of the NBMG staff. As examples, in 2006 and 2007 NBMG scientists and members of the technical support staff:

- received best-paper-of-the-year awards for published articles in peer-reviewed journals (from the American Water Resources Association, the Association of Environmental and Engineering Geologists, and the Society of Economic Geologists);
- testified before the U.S. Senate and Nevada Senate on issues regarding geothermal energy;
- served as editor of two refereed scientific journals and on the editorial board of another;
- served on six advisory panels, task forces, and committees for the federal government;
- served five times on advisory panels and committees for the Nevada state government;
- served as officers in three international, two national, and nine state scientific and technical organizations;
- served as an expert witness for the state and federal government in several mining-fraud cases;
- chaired 21 committees of international, national, regional, and state scientific organizations;
- served 49 times as committee members, field trip leaders, technical session chairs, or in other capacities for national and international scientific organizations;
- served 73 times as committee members, field trip leaders, workshop instructors, or other positions for state, regional, and local scientific and professional organizations;
- made 315 technical presentations, often with published abstracts, at scientific meetings and other venues;
- made over 112 presentations to K-12 school children;
- taught four classes and served as guest lecturers 11 times in classes at the University of Nevada, Reno;
- served as review coordinator for two National Research Council - National Academy of Sciences studies;
- were interviewed 15 times by television, radio, and print media;
- provided free technical assistance to various consultants, engineers, lawyers, and citizens of Nevada and elsewhere; and
- reviewed numerous articles for scientific journals and U.S. Geological Survey publications and several proposals for funding of research by the National Science Foundation and other agencies.

In recent years, NBMG has made a concerted effort to create special publications for the general public and for users who are pursuing economic development opportunities in Nevada. Significant additions to our offerings for students, teachers, and the general public include new one-day field trips for the general public as part of the annual Earth Science Week (available online as part of the Educational Series at http://www.nbmg.unr.edu/dox/dox.htm) and points of geological interest located by GPS coordinates (EarthCache sites at http://www.nbmg.unr.edu/earthcache/ec.htm). For those interested in exploring for and developing mineral and energy resources, most of our mining-related files, including many one-of-a-kind reports and maps, are now available online at ftp://comstock.nbmg.unr.edu/pub/MD/Start.htm; many of our databases on mineral and energy resources are accessible in interactive maps with useful geographic locators at http://gis2.nbmg.unr.edu/; geothermal information is accessible through http://www.nbmg.unr.edu/geothermal/gthome.htm; and high-quality scans of logs from most oil and gas exploration and production wells drilled in the state are posted at http://www.nbmg.unr.edu/lists/oil/oil.htm. All our Web offerings are linked through www.nbmg.unr.edu.

Several NBMG Special Publications are reaching users in bookstores throughout Nevada and other parts of the country. All publications can be ordered online (www.nbmg.unr.edu), and selected publications, several Educational Series items, NBMG's annual publication, *The Nevada Mineral Industry*, and the joint publication with the Nevada Division of Minerals, *Major Mines of Nevada*, are provided to the public for free on the Web. As costs for data storage have dropped, and as more people have gained access through the Web at home, businesses, schools, and libraries, NBMG now provides most new maps and reports to the professional users and general public for free on the Web.

For more information about the Nevada Bureau of Mines and Geology, or about the geology, resources, and environmental issues in Nevada, please feel free to contact us. Special thanks go to Terri Garside for assistance in editing this document and pulling together some of the key information and to Charlotte Stock for editing.

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29 December 2008

# APPENDIX A

## Activities of NBMG in 2006 and 2007

This appendix includes citations of publications produced by NBMG and authored by NBMG scientists; grants awarded to principal investigators on the NBMG staff; invited lectures, public presentations, and other professional activities of the NBMG staff; and awards and honors during the past two years.

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## ACTIVE RESEARCH GRANTS—2006 AND 2007

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National Science Foundation, Quasi-Block Modeling of Walker Lane Tectonic Deformation, Using Geodetic and Geologic Data to Constrain System Complexity and Time-Variable Behavior, 8/06-7/09, $236,776, **Hammond, W.C.**, **Kreemer, C.W.**, and **Blewitt, G.**

Nevada Geothermal Power Company, Developing a conceptual structural model for the Blue Mountain geothermal field, Humboldt County, Nevada: 12/07, $2,000, **Faulds, J.E.**

Nevada Power, UNR participation in the Nevada Geothermal Energy Technical Advisory Panel, 7/11/07-12/31/09, $10,044, **Shevenell, L., Faulds, J.E.**, and **Garside, L.G.**

Newmont Mining Corporation, Subsidence research in the Pumpernickel-Kelly Creek Basin area, 7/05–9/07, $142,231, **Bell, J.W.**

Placer Dome, Turquoise Ridge, 2/05–3/07, $41,600, **Muntean, J.L.**

Pyramid Lake Paiute Tribe, Task C-3: Geothermal Assessment of Pyramid Lake Paiute Lands, 10/04-2/06, $35,959, **Faulds, J.E.**, and Louie, J.

Queenstake Resources, Jerritt Canyon, 6/1/05 to 6/1/08, $88,000, **Muntean, J.L.**, and **Henry, C.D.**

Ralph J. Roberts Center for Research in Economic Geology, University of Nevada Reno, Hydrothermal footprint of the Carlin-type deposits of the Jerritt Canyon District: district-scale patterns of trace elements, alteration, and isotopes along the Saval discontinuity, 1/1/07 to 12/31/08, $37,940, gift to fund Lucia Patterson's MS thesis, **Muntean, J.L.**

State of Nevada: Commission on Mineral Resources, Division of Minerals, Science Sample and Records Library, 09/06/07 to 09/05/09, $100,000, **Price, J.G.**

State of Nevada, Mining Cooperative Fund Research, 7/07–6/08, $70,000; 7/06–6/07, $70,000, 7/05–6/06, $70,000, **Price, J.G.**

State of Nevada, Nevada Earth/Space Science Initiative (NESSI), 3/07-9/08, $226,000, Crowther, D., and **LaPointe, D.D.**

U.S. Bureau of Land Management, Clark County geologic mapping, 5/9/07 to 5/08/12, $984,883, **Faulds, J.E.**, and **House, P.K.**

U.S. Bureau of Land Management, Traveling the Great Basin Highway, A Guide to the Geology and Natural History along U.S. Highway 93 in Nevada and Arizona, 9/04-9/09, $117,574, **Price, J.G.,** and **Tingley, J.V.**

U.S. Bureau of Reclamation, Walker Lake Task 2-7B, 11/07-3/11, $24,250, **House, P.K.**

U.S. Department of Energy, Geodetic Monitoring of the Yucca Mountain Region using Continuous Global Positioning System Measurements, 10/1/03 to 9/30/09, $5,864,226, **Price, J.G.**, and **Blewitt, G.**

U.S. Department of Energy, Golden Field Office, Expanding geothermal resource utilization in Nevada through directed research and public outreach, 6/05–12/08, $992,133, **Shevenell, L**., includes: Geochemical sampling of thermal and non-thermal waters in Nevada: Continued evaluation of geothermal resources, $65,685, **Shevenell, L., Lechler, P.L., Garside, L.J.**, and Coolbaugh, M.; Management of the research and outreach programs at the Great Basin Center for Geothermal Energy, $309,258, **Shevenell, L.**;. Revival of grass-roots geothermal exploration in the Great Basin (where to look for new geothermal fields) -- a new approach to assessing geothermal potential using a geographic information system (GIS): parts IV and V., $299,923, Coolbaugh, M., Zehner, R.E., **Kreemer, C.W.**, Sawatzky, D., Oppliger, G., Blackwell, D., **Shevenell, L.**, Taranik, J., and Raines, G.; Satellite InSAR (interferometric synthetic aperture radar) ground displacement analysis for geothermal reservoir management and development, $258,040, Oppliger, G., Coolbaugh, M., **Shevenell, L.**, Widmer, R.; Geothermal applications of multi-gas geochemistry, $92,226, **Lechler, P.L., Garside, L.G.**, Coolbaugh, M., and **Shevenell, L.**

U.S. Department of Energy, Golden Field Office: Expanding geothermal resource utilization in Nevada through directed research and public outreach 10/04–9/07, $981,000 **Shevenell, L.**, includes: Regional assessment of exploration potential for geothermal systems in the Great Basin using a geographic information system (GIS) – Part II, $93,023, Coolbaugh, M., Raines, G., **Shevenell, L.**, Minor, Sawatzky, D., and Oppliger, G.; Geochemical sampling of thermal and non-thermal waters in Nevada: Evaluation of geothermal resources for electrical power generation and direct-use applications, $59,000, **Shevenell, L**, and **Garside, L.G.**;). Management of the research and outreach programs at the Great Basin Center for Geothermal Energy, $430,000, **Shevenell**, **L.**

U.S. Department of Energy, Golden Field Office, Geothermal research and outreach at the Great Basin Center for Geothermal Energy, 6/15/06-12/31/08, $990,000, **Shevenell, L.**

U.S. Department of Energy, Golden Field Office, Geothermal research at the Great Basin Center for Geothermal Energy, 11/1/07-12/31/08, $350,000, **Shevenell, L.**

U.S. Department of Energy, Great Basin Center for Geothermal Energy, Characterization of active faulting and neotectonics at Nevada geothermal sites, 11/2007-12/2008, $56,485, **Bell, J.W.**, and **Ramelli, A.R.**

U.S. Department of Energy, Great Basin Center for Geothermal Energy, Characterizing Structural Controls on Geothermal Systems in the Northwestern Great Basin through Integrated Geologic and Geophysical Analyses, 7/05–9/07, $212,823, **Faulds, J.E.**, Oppliger, G., and Coolbaugh, M.

U.S. Department of Energy, Great Basin Center for Geothermal Energy**,** Characterizing Controls on Geothermal Systems in the Northern Great Basin through Integrated Structural Analysis and Modeling: 12/01/07 to 6/30/09, $90,964, , **Faulds, J.E.**, Oppliger, G., and Coolbaugh, M.

U.S. Department of Energy, Great Basin Center for Geothermal Energy, Crustal strain-state analysis through deep electrical anisotropy mapping: an alternative tool for identifying the orientation of critically stressed fractures for EGS projects, 7/05–9/06, $318,302, Oppliger, G., Coolbaugh, M., and **Kreemer, C.W.**

U.S. Department of Energy, Great Basin Center for Geothermal Energy, Geologic and geophysical analysis of the Desert Peak-Bradys Geothermal Fields: Structural controls on geothermal reservoirs in the Humboldt structural zone, 10/03–9/06, $135,393, **Faulds, J.E.**, Oppliger, G., and **Garside, L.J.**

U.S. Department of Energy, Great Basin Center for Geothermal Energy, Geothermal spring sampling, 3/02-12/08, $189,450, **Shevenell, L., Garside, L.J.**, Coolbaugh, M., and **Lechler, P.L.**

U.S. Department of Energy, Great Basin Center for Geothermal Energy, Pattern and timing of active faulting along Nevada geothermal systems, 10/05–12/08, $168,430, **Bell, J.W.**, and **Ramelli, A.R.**

U.S. Department of Energy, Great Basin Center for Geothermal Energy, Pyramid Paiute Indian Tribe, Geothermal Assessment of Pyramid Lake Paiute Reservation Lands, 10/04–6/07, $271,778, **Shevenell, L.**, Coolbaugh, M., Oppliger, G., **Faulds, J.E**., Calvin, W., and Louie, J.

U.S. Department of Energy, Great Basin Center for Geothermal Energy, Structural and geophysical analysis of the Desert Peak-Bradys Geothermal Fields: Identifying links between northeast-trending structures and geothermal anomalies in the Great Basin, 3/02–10/06, $95,811, **Faulds, J.E.**, **Garside, L.J.**, and Oppliger, G.

U.S. Department of Energy, Great Basin Center for Geothermal Energy, Targeting of Potential Geothermal Resources in the Great Basin from Regional to Basin-Scale Relationships between Geodetic Strain and Geological Structures, 7/05–12/08, $236,532, **Blewitt, G.**, **Hammond, W.C.**, and **Kreemer, C.W.**

U.S. Department of Energy, Great Basin Science Sample and Records Library – Phase I, 7/01/06 to 9/30/09, $3,465,000, **Price, J.G.**

U.S. Department of Energy, Idaho Operations Office, Expanding geothermal resource utilization in Nevada through directed research and public outreach, 5/03–12/08, $963,364, **Shevenell, L.**, and Long, J.C.S.

U.S. Department of Energy, National Renewable Energy Laboratory, Continuation of Exploratory drilling program to evaluate the lifetime and current potential of the Humboldt House geothermal system, Pershing County, Nevada, 4/2/03-3/30/07, $110,617, Tempel, R., and **Shevenell, L.**

U.S. Department of Energy, National Renewable Energy Laboratory, Exploratory drilling program to evaluate the lifetime and current potential of the Humboldt House geothermal system, Pershing County, Nevada., 4/2/03-03/30/07, $499,494, Temple, R., **Shevenell, L.**, Ellis, Waibel, and Barta, J.

U.S. Department of Energy, National Renewable Energy Laboratory, The Geothermal and Renewable Energy Laboratory of Nevada (GRELN) Planning and Assessment, 7/5/05-12/30/07, $350,000, Gates, A., and **Shevenell, L,**; includes UNR-REC Work Package Identifier I-2-1a "Site Assessment" of the Redfield Campus, 7/5/05-12/31/07, $46,339, Oppliger, G. and **Shevenell, L.**

U.S. Department of Energy (passed through the California Energy Commission), Sequestration of $CO_2$ using Mafic and Ultramafic Rocks and through Enhanced Oil Recovery, 4/04/06 to 3/31/08, $75,000, **Price, J.G.**

U.S. Department of Homeland Security, Federal Emergency Management Agency (passed through the Nevada Division of Emergency Management): Earthquake Risk Mitigation in Nevada, 10/1/07 to 1/31/09, $88,973; 10/1/06 to 12/31/07, $88,973; 10/1/05 to 12/30/06, $88, 973, **dePolo, C.M.**, **Price, J.G.**, Anderson, J.G., and dePolo, D.

U.S. Department of Homeland Security, Federal Emergency Management Agency (passed through the Nevada Division of Emergency Management), Funding for the Nevada Hazard Mitigation Planning Committee, 11/24/05 to 11/25/09, $42,493, **Price, J.G.**

U.S. Department of Homeland Security, Federal Emergency Management Agency (passed through the Nevada Division of Emergency Management): State Hazard Mitigation Risk Assessment, 04/06/07 to 02/08/09, $1,442, **Price, J.G.**

U.S. Department of Homeland Security, Federal Emergency Management Agency (passed through the Nevada Division of Emergency Management): State Risk Assessment, 8/4/06 to 2/8/09, $53,842, Underwood, S.J., and **Price, J.G.**

U.S. Department of Homeland Security, FFY05 Pre-Disaster Mitigation HAZUS Data Update, 10/05–10/09, $60,063, **Johnson, G.L.**, and **Arritt, C.**

U. S. Fish and Wildlife Service, Ecosystem Flow Recommendation Study, Bill Williams River, AZ, 8/04-8/09, $36,000, **House, P.K.**

U.S. Geological Survey, Inventory of geologic data, 7/07-6/08, $5,000, **Davis, D.**

U.S. Geological Survey, Mineral Resources External Research Program, Collaborative research on fluid pathways, and metal transport and deposition in Carlin-type gold deposits: insights from the Getchell system, 6/30/06 to 6/30/08, $151,000 (of which $38,672 is to UNR), Cline, J.S., and **Muntean, J.L.**

U.S. Geological Survey, National Earthquake Hazards Reduction Program, Estimating Seismic Hazard in the Basin and Range Province Using Horizontal GPS Data: Collaborative Research between the University of

Nevada, Reno and the USGS, 1/07-12/07, $66,891, **Hammond, W.C.**, and **Kreemer, C.W.**

U.S. Geological Survey, National Earthquake Hazards Reduction Program, Estimating uncertainties of seismic hazard parameters for Nevada faults, formation of a Nevada Quaternary Fault Working Group, and gaining consensus fault parameters, 4/06-5/08, $64,811, **dePolo, C.M.**

U.S. Geological Survey, National Earthquake Hazards Reduction Program, InSAR across the Sierra Nevada—Basin and Range transition zone, 01/2006-12/2007, $33,578, **Bell, J.W.,** and Oppliger, G.

U. S. Geological Survey, National Earthquake Hazards Reduction Program, Liquefaction susceptibility mapping in Carson Valley, west-central Nevada, 3/05–2/06, $63,682, **dePolo, C.M.,** and **Ramelli, A.R.**

U.S. Geological Survey, National Earthquake Hazards Reduction Program, Paleoseismic studies of the Little Valley fault, 5/02–4/07, $71,151, **Ramelli, A.R., dePolo, C.M.,** and **Bell, J.W.**

U.S. Geological Survey, National Earthquake Hazards Reduction Program, System Design for a GPS component of Real-Time Earthquake Source Determination and Tsunami Warning Systems: Collaborative Research with University of Nevada, Reno and Northwestern University, 12/06-11/07, $55,000, **Blewitt, G.**, **Hammond, W.C.**, **Kreemer, C.W.**, **Plag, H.-P.**, Stein, S., and Okal, E.

U. S. Geological Survey, National Earthquake Hazards Reduction Program, Quaternary faulting and seismic source characterization in the Las Vegas Metropolitan Area, 1/06–12/06, $59,408 (of which $8,671 is to UNR), Taylor, W., and **dePolo, C.M.**

U.S. Geological Survey, ACEC Mineral Evaluation, Southern Nevada and MRDS studies, Clark and southern Nye Counties, 9/03–11/06, $221,000, **Castor, S.B.** and **LaPointe, D.D.**

U.S. Geological Survey, Southern Nevada and MRDS Studies: Searchlight district, 11/05–11/06, $30,998, **Faulds, J.E.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, GIS Conversion of 19 specific published geologic maps, 5/06-9/07, $61,802, **Crouse, E.C.**, and **Johnson, G.L.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, GIS Conversion of 40 specific published geologic maps, 5/07-10/08, $155,514, **Hastings, J.**, **Crouse, E.C.**, and **Johnson, G.L.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic mapping in the north half of the Fernley West Quadrangle, 05/07–10/08, $30,592, **Faulds, J.E., Ramelli, A.R.,** and **Henry, C.D.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic mapping in the south half of the Fernley West Quadrangle, 05/05–10/06, $22,062, **Faulds, J.E., Ramelli, A.R.,** and **Bell, J.W.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic mapping in the Flowery Peak (east half) Quadrangle, 5/05–10/06, $22,841, **Castor, S.B.**, and **House, P.K**.

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic Mapping in Urban and Rural Nevada, Jerritt Canyon mining district, 5/05–4/06, $38,769, **Muntean, J.L.,** and **Henry, C.D.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic Mapping in Urban and Rural Nevada, Jerritt Canyon mining district, 5/06–9/07, $47,305, **Muntean, J.,** and **Henry, C.D.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic mapping in the Lahontan Mountain quadrangle, 05/2006-9/2007, $44,015, **Bell, J.W**., and **House, P.K.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic mapping in the Searchlight Quadrangle, 5/05–10/06, $27,211, **Faulds, J.E., Ramelli, A.R.,** and **Bell, J.W.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic mapping in urban and rural Nevada, north half Seven Lakes Mountain, 5/05–10/06, $24,149, **Henry, C.D.,** and **Ramelli, A.R.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic mapping of the north half of the Spirit Mountain NW Quadrangle, 5/1/07 to 8/31/08, $28,453, **House, P.K.**, and **Faulds, J.E.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic mapping of the Stockton Flat Well Quadrangle, 5/1/06-9/30/07, $52,050, **Henry, C.D.**, Boden, D., and **Ramelli, A.R.**

U.S. Geological Survey, STATEMAP portion of the National Cooperative Geologic Mapping Program, Geologic mapping of the Jerrit Canyon Quadrangle, 5/1/06-9/30/07, $47,305, **Muntean, J.L.**, and **Henry, C.D.**

## PRESENTATIONS AND ABSTRACTS—2006


Arritt, C.M., and Johnson, G.L., HAZUS, ArcMap and you: earthquake scenario for Las Vegas, FEMA, and Nevada needs a HUG?, Nevada Geographic Information Society, Las Vegas, Nevada (2006).

Arritt, C.M., and Johnson, G.L., NBMG HAZUS project update, Nevada HAZUS Users Group, Reno, Nevada (2006).

Arritt, C.M., HAZUS-MH: FEMA's risk assessment tool for hazard identification and mitigation, Hazmat EXPLO 2006, Las Vegas, Nevada (2006).

Arritt, C.M., Installation of HAZUS-MH MR2: Ordering, installation tips and possible pitfalls, Nevada HAZUS User's Group, Reno, Nevada (2006).

Baffoe-Twum, E., Bell, J.W., Tyler, S.W., and Fischer, J.R., 2006, Using InSAR to determine aquifer system response in north central Nevada related to mine de-watering: Eos Transactions, American Geophysical Union Annual Meeting, v. 87, no. 52, Abstract H51D-0520. Student presentation of funded project results.

Baffoe-Twum, E., Bell, J.W., Tyler, S.W., and Fischer, J.R., 2006, Using InSAR to determine land subsidence in the Pumpernickel Valley-Kelly Creek basin, Nevada: Nevada Water Resources Association, Annual Meeting. Student presentation of funded project results.

Bazar, D., Miller, J., Miller, C., Dodge, M., Hodge, K., and Faulds, J.E., 2006, Eruption of Deep Mushy Magma from the Searchlight Magma System, Southern Nevada (USA): a Crystal Size Distribution and Geochemical Analysis: Eos Transactions AGU, 87(52), Fall Meeting Supplement, Abstract.

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Blewitt, G., 2006, The Fixed Point Theorem of Ambiguity Resolution for Precise Point Positioning of GPS Networks: Theory and Applications, American Geophysical Union, San Francisco.

Blewitt, G., Task 3 Review Meeting, Yucca GPS Analysis, DOE Yucca Mountain Project, Summerlin. (June 2006).

Blewitt, G., Understanding Sea Level Rise and Variability, Regional and Global Measurements: The Reference Frame for Understanding Observations, Invited, UNESCO, Paris. (June 2006).

Blewitt, G., Dow, J., and Riizos, C., Preparing the IGS Strategic Plan 2008-2012: Solicitation of Ideas on the Future Needs of Scientific and other Users, Invited, IGS Workshop 2006, International GPS Service - European Space Agency, Darmstadt, Germany. (May 2006).

Blewitt, G., Rapid Determination of Earthquake Magnitude using GPS for Tsunami Warning Systems, Invited, University College, London, London, UK. (April 2006).

Blewitt, G., Rapid Determination of Earthquake Magnitude using GPS for Tsunami Warning Systems, Invited, California Institute of Technology, Pasadena. (April 2006).

Blewitt, G. Rapid Determination of Earthquake Magnitude using GPS for Tsunami Warning Systems, NASA Jet Propulsion Laboratory, JPL, Pasadena. (April 2006).

Blewitt, G. Rapid Determination of Earthquake Magnitude using GPS for Tsunami Warning Systems, Invited, University of Newcastle upon Tyne, Newcastle upon Tyne, UK. (April 2006).

Blewitt, G., Kreemer, C. W., Hammond, W. C., and Plag, H.-P., Rapid Determination of Earthquake Magnitude using GPS for Tsunami Warning Systems: An Opportunity for IGS to Make a Difference, Invited, United States-Japan Cooperative Program in Natural Resources, Tokyo, Japan. (November 2006).

Blewitt, G., Kreemer, C. W., Hammond, W. C., and Plag, H.-P., Rapid determination of earthquake magnitude using GPS for tsunami warning systems: Required accuracy of real-time GPS satellite orbits, Invited, Committee on Space Research, Beijing, China. (July 2006).

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Blewitt, G., Kreemer, C. W., Hammond, W. C., and Plag, H.-P., Rapid Determination of Earthquake Magnitude using GPS for Tsunami Warning Systems: An Opportunity for IGS to Make a Difference, Invited, IGS Workshop 2006, International GPS Service - European Space Agency, Darmstadt, Germany. (May 2006).

Blewitt, G., Kreemer, C. W., Hammond, W. C., and Plag, H.-P., Rapid Determination of Earthquake Magnitude using GPS for Tsunami Warning Systems, European Geophysical Society, Vienna. (April 2006).

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using GPS for tsunami warning systems, Invited, Tsunami Sources Workshop, United States Geological Survey, Menlo Park. (April 2006).

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Blewitt, G., Hammond, W. C., Kreemer, C. W., and Plag, H.-P., GPS at Slide Mountain, EarthScope's Plate Boundary Observatory Extension Working Group Meeting, UNAVCO Inc., Reno. (March 2006).

Blewitt, G., and Larson, K., Reducing the effects of multipath in high-rate GPS analysis: evaluation and implementation of modified sidereal filtering, IGS Workshop 2006, International GPS Service - European Space Agency, Darmstadt, Germany. (May 2006).

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Clarke, P., and Blewitt, G., Consistent and Accurate Representation of Surface Mass Loading Using Modified Basis Functions, American Geophysical Union, San Francisco. (December 2006).

Craymer, M., and Blewitt, G., SNARF 1.0: An ITRF-Based Regional Reference Frame for North America, Geodetic reference Frames 2006 Symposium, International Association of Geodesy, Munich. (October 2006).

dePolo, C.M. and Earl, P., 2006, Effects and Response of Nevada to the Great 1906 San Francisco, California Earthquake: Seismological Research Letters, v. 77, p. 249-250.

dePolo, C.M., Why we underprepare for hazards, National Earthquake Program Managers Meeting, Federal Emergency Management Agency (2006).

dePolo, C.M., Earthquakes, presentation at the Nevada Joint Information Center (public information officers of state agencies), Carson City (2006).

Faulds, J.E., and Henry, C.D., 2006, The evolving transform, orogenic collapse, and "de-arcing" of the western North American cordillera: Is the Walker Lane the site of the future plate boundary?: Geological Society of America Specialty Meetings Abstracts with Programs, Backbone of Americas Meeting, Mendoza, Argentina, no. 2, p. 110.

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Faulds, J.E., Geologic and geophysical analyses of geothermal fields in the northwestern Great Basin, Western USA: characterizing structural and tectonic controls: ENGINE Workshop, Potsdam, Germany (Nov. 6, 2006).

Faulds, J.E., Characterizing structural controls of geothermal fields in the northwestern Great Basin: a progress report: Geothermal Resources Council Annual Meeting, San Diego (Sept 11, 2006).

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Garside, L.J., Henry, C.D., and Faulds, J.E., Paleogene paleovalleys across the Sierra Nevada, UNR-Nevada Bureau of Mines and Geology seminar (November 15, 2006).

Hammond, W.C., The active geology of Sagehen Creek, Lake Tahoe and the Sierra Nevada, University of California Sagehen Field Station (August 11, 2006).

Hammond, W.C., Campaign GPS measurements and Block Modeling of the Northern Walker Lane, UNR- Nevada Bureau of Mines and Geology seminar, (May 2006).

Hammond, W.C., Concepts of maps and spatial awareness, Glenshire Elementary School, Truckee, California (January 20, 2006).

Hammond, W.C., Guest lecture, UNR Geology 730, Geologic History of Nevada (January 30, 2006).
Hammond, W.C., Exploring, Measuring, and Mapping Planet Earth, Guest Lecturer for UNR Geography 210 (April 18, 2006).
Hammond, W.C., Yucca Mountain InSAR Analysis Update, Department of Energy, Summerlin, Nevada (May 2006).
Hammond, W.C., Active Basin and Range deformation measured with GPS: a kinematic overview, Invited, U.S. Geological Survey, Meeting of the U.S.G.S. Basin and Range Province Earthquake Working Group, Salt Lake City, UT. (March 2006).
Hammond, W.C., Northwest Basin and Range campaign GPS results: what they imply for backarc extension and forearc motion, plus a look at the northern NV & CA Basin and Range, Invited, PANGA, University of Oregon, Eugene, OR. (February 2006).
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Hammond, W.C., and Thatcher, W., Crustal Deformation across the Sierra Nevada, Northern Walker Lane, Basin and Range Transition, Western United States Measured with GPS, 2000-2004, UNR-Nevada Bureau of Mines and Geology seminar (May 10, 2006).
Henry, C.D., and Faulds, J.E., 2006, Similar and contrasting response of rifting and transtension in the Gulf of California and Walker Lane to preceding arc magmatism: Eos Transactions AGU, 87(52), Fall Meeting Supplement, Abstract T41D-1593.
Henry, C.D., and Faulds, J.E., 2006, The Walker Lane and Gulf of California: Related expressions of Pacific-North American plate boundary development: Lithospheric Rupture in the Gulf of California - Salton Trough Region National Science Foundation Margins Workshop, Ensenada, Mexico, Jan. 11, 2006 (www.rcl-cortez.wustl.edu/Workshop_Abstracts.pdf; www.rcl-cortez.wustl.edu/Presentations.html).
Henry, C.D., Castor, S.B., McIntosh, W.C., Heizler, M.T., Cuney, M., and Chemillac, R., 2006, Timing of oldest Steens Basalt magmatism from precise dating of silicic volcanic rocks, McDermitt caldera and northwest Nevada volcanic field: Eos Transactions AGU, 87(52), Fall Meeting Supplement, Abstract V44C-08.
Henry, C.D., Evolution of late Cenozoic magmatism in the northern Sierra Nevada; implications for subduction and subsequent deformation: Sierra Nevada EarthScope Experiment Workshop, Sorensen's Resort, Hope Valley, California (Oct. 10, 2006, http://cires.colorado.edu/people/jones.craig/SierraDrips/2006workshop/).
Henry, C.D., Influence of Cenozoic magmatism on localization of plate boundary shear, EarthScope GeoFrame Walker Lane Workshop, Reno, Nevada (May 15, 2006).
Hursh, J.P., Slide show promoting publication: Geologic and Natural History Tours in the Reno Area, Reno Gem and Mineral Society (2006).
Hursh, J.P., Slide show promoting publication: Geologic and Natural History Tours in the Reno Area, Kiwanis Club, Reno, Nevada (2006).
Hursh, J.P., Slide show and book signing promoting publication: Geologic and Natural History Tours in the Reno Area, Sundance Bookstore, Reno, Nevada (2006).
Hursh, J.P., Slide show and book signing promoting publication: Barn in the USA, a nationally distributed book on western historical barns, Bartley Ranch Park, Reno, Nevada (2006).
Hursh, J.P., Slide show: Bartley Ranch Park Historical Ranch Outbuilding Project, Preserve Nevada Conference, Ely, Nevada (2006).
Katzenstein, K., and Bell, J.W., 2006, InSAR reveals aquifer response to groundwater use in the Yucca Mountain-Amargosa Valley-Ash Meadows region, southwestern Nevada/southeastern California: Nevada Water Resources Association Annual Meeting Abstracts. Student presentation of funded project results.
Katzenstein, K. and Bell, J.W., 2006, Using InSAR to delineate groundwater related deformation in the Great Basin: Geological Society of America Abstracts with Program, Annual Meeting, v. 38, no. 7, p. 291. Student presentation of funded project results.
Katzenstein, K.W., and Bell, J.W., 2006, Bedrock subsidence associated with mine de-watering identified by InSAR in central Nevada: Eos Transactions, American Geophysical Union Annual Meeting, v. 87, no. 52, Abstract H51D-0516. Student presentation of funded project results.
Kreemer, C.W., Modeling the Strain Rate Field from GPS Velocities, U.S. Department of Energy, Summerlin, NV (April 2006).

Kreemer, C.W., Using SNARF: Lessons learned, Invited, EarthScope SNARF Working Group, Ottawa, Canada (November 16, 2006).

Kreemer, C.W., GPS research on Basin and Range Tectonics, Invited, University of Nevada, Las Vegas, Las Vegas (April 18, 2006).

Kreemer, C.W., Guest lecturer, Exploring, measuring, and mapping planet Earth, Geology 210, UNR (April 18, 2006).

Kreemer, C.W., Guest lecturer, Graduate seminar, Geology 697, UNR (November 21, 2006).

Kreemer, C.W., Guest Lecturer, Advanced geology of Nevada and the Basin and Range, Geology 730, UNR (January 30, 2006).

Kreemer, C.W., Lavallée, D.A., Blewitt, G., and Holt, W.E., 2006, On the stability of a geodetic no-net rotation reference frame, effects of frame translation, and implications for the ITRF, Invited, American Geophysical Union, San Francisco.

Kreemer, C.W., Lavallée, D.A., Blewitt, G., and Holt, W.E., Constraining No-Net Rotation of the Terrestrial Reference Frame, Geodetic Reference Frames 2006 Symposium, International Association of Geodesy, Munich. (October 11, 2006).

Kreemer, C.W., and Blewitt, G., On the stability of a geodetic no-net rotation frame, effects of frame translation, and implications for the ITRF, Invited, American Geophysical Union, San Francisco. (December 2006).

Kreemer, C.W., Blewitt, G., and Hammond, W.C., Using geodesy to explore correlations between crustal deformation characteristics and geothermal resources, Geothermal Resources Council, San Diego. (September 13, 2006).

Kreemer, C.W., Blewitt, G., and Hammond, W.C., Using geodesy to explore correlations between crustal deformation characteristics and geothermal resources, UNR-Nevada Bureau of Mines and Geology seminar (November 16, 2006).

Kreemer, C.W., and Hammond, W.C., 2006, Active Basin and Range deformation inferred from horizontal GPS: a kinematic overview, Invited, U.S. Geological Survey, Intermountain West Seismic Hazard workshop, Reno, NV.

Kreemer, C.W., Hammond, W.C., and Blewitt, G., On the motion and geometry of the Sierra Nevada – Great Valley micro-plate: Implications for Walker Lane tectonics, Invited, American Geophysical Union, San Francisco. (December 2006).

Kreemer, C.W., and Plag, H.-P., Are post-glacial rebound model predictions consistent with the global space-geodetic secular velocity field?, 2006 UNAVCO Science Workshop, Denver (March 2006).

Kruger, J.M., Faulds, J.E., and Reynolds, S.J., 2006, Seismic Reflection Crustal Structure and 3-D Geometry of Cordilleran Metamorphic Core Complexes in West-Central Arizona: Eos Transactions AGU, 87(52), Fall Meeting Supplement, Abstract.

Lavallee, D., and Blewitt, G., The terrestrial reference frame and surface mass loading, Invited, European Geophysical Society, Vienna. (April 2, 2006).

LaPointe, D.D., Geology and mines of west-central Nevada, Churchill County Museum (April 4, 2006).

LaPointe, D.D., Presented 35 short mineral activities to teachers, students, and other groups who toured the Mackay School of Earth Sciences and Engineering, 2006, including students, teachers, and parents from Portola, Westergard, Jessie Beck, Anderson, Alyce Taylor, Roberta Cartwright, Sun Valley, Alice Smith, Hunter Lake, Dayton, Fernley, Hunsberger, Silver Stage, Roger Corbett, and Van Gorder Elementary Schools.

LaPointe, D.D., Gave 20 geological and career presentations off-campus to teachers, students, museum groups, and the general public, 2006, including Our Lady of Snows Elementary School, Sparks High School, Westergard Elementary School, Dayton Intermediate School, and Wooster High School.

Lilja Bye, B., Plag, H.-P., Rickards, L., Bingley, R., Knudsen, P., and Rosen, D., European Sea Level Service Research Infrastructure, Annual Assembly of EGU, Vienna, Austria (April 2006).

Mauldin, J., 2006, Poster Session: Converting Adobe Illustrator maps to ArcGIS format, Digital Mapping Techniques '06 Workshop, Columbus, Ohio.

Mauldin, J., 2006, Map display: the Geologic map of the Wadsworth quadrangle by Bell, J.W., House, P.K., and Garside, L.J., 2005, was on display by Jennifer Mauldin, NBMG cartographer, in the Map Gallery at the 26th Annual ESRI International Users Conference, San Diego, August 7-11.

Miller, J., Miller, C., Wooden, J., Perrault, D., Hodge, K., Faulds, J.E., Cates, N., and Means, M., 2006, A 2 Million Year History of Plutonism and Volcanism in the Searchlight Magma System, Eldorado Mountains, Nevada (USA): Eos Transactions AGU, 87(52), Fall Meeting Supplement, Abstract.

Muntean, J.L., 2006, The porphyry-epithermal transition: examples from the Maricunga Belt: Geological Society of Nevada, February Newsletter, p. 11. [Invited lecture]

Muntean, J.L., Guest lecturer, Ore deposits, Geology 671, UNR (two lectures in 2006).

Muntean, J.L., The Porphyry-Epithermal Transition: examples from the Maricunga Belt, presentation to Kinross Gold, Bema Gold, and Minera Andina geologists, Refugio Mine, Andes Mountains, Chile, February 21st, 2006.

Muntean, J.L., Turquoise Ridge deposit: basin margin control on gold grade, presented to Queenstake Resources geologists (March 15, 2006).

Muntean, J.L., Geology, mineral exploration, and mapping, Brown Elementary School, Reno, Nevada (March 31, 2006). [Invited]

Muntean, J.L., Mentoring, presented at the Society of Economic Geologists Symposium in Keystone, Colorado (May 13, 2006). [Invited]

Muntean, J.L., The Porphyry-Epithermal Transition: examples from the Maricunga Belt, presented at the Colorado School of Mines, Golden, Colorado (October 19, 2006).

Neilan, R., Plag, H.-P., and nine others, Geosciences and GNSS: contributions of the International GNSS Service (IGS) today and in the future, Invited, Annual Assembly of EGU, Vienna, Austria. (April 2006).

Oppliger, G. and Bell, J.W., 2006, Estimating horizontal land surface displacements accompanying subsidence observed with satellite differential radar interferometry (InSAR): Proceedings, 2006 Annual Conference, American Society for Photogrammetry and Remote Sensing.

Plag, H.-P., Special Bureau for Loading: potential role versus reality, Invited, IAG/IERS, IERS Workshop on GGFC, Academic, San Francisco (December 6, 2006).

Plag, H.-P., Improving observations and interpretation of changes in Earth's shape: present and future contributions of the GGFC, Invited, IAG/IERS Workshop on GGFC, San Francisco (December 5, 2006).

Plag, H.-P., The Global Geodetic Observing System and the Global Geophysical Fluid Center, Invited, IAG/IERS Workshop on GGFC, San Francisco (December 5, 2006).

Plag, H.-P., The Global Geodetic Observing System: meeting the requirements of a global society on a changing planet in 2020, Invited, Geohazards Joint Committee Meeting, UNESCO/GARS/IGOS-P, Bonn, Germany (November 27, 2006).

Plag, H.-P., A Community of practice on georeferencing and geodetic reference frames, Second Meeting of the GEO User Interface Committee, Ottawa, Canada (September 6, 2006).

Plag, H.-P., The Global Geodetic Observing System: meeting the requirements of a global society on a changing planet in 2020, Invited, First GGOS 2020 Writing Team meeting, IAG/GGOS, Paris (June 8, 2006).

Plag, H.-P., The Global Geodetic Observing System: meeting the requirements of a global society on a changing planet in 2020, Invited, Second GGOS 2020 Writing Team meeting, IAG/GGOS, Washington, D.C. (August 21, 2006).

Plag, H.-P., The Global Geodetic Observing System: meeting the requirements of a global society on a changing planet in 2020, Invited, Third GGOS2020 Writing Team meeting, IAG/GGOS, Munich, Germany (October 11, 2006).

Plag, H.-P., The Global Geodetic Observing System: meeting the requirements of a global society on a changing planet in 2020, Invited, IAG/GGOS, Fourth GGOS 2020 Writing Team meeting, San Francisco (December 10, 2006).

Plag, H.-P., Height variations, U.S. Department of Energy, Las Vegas (June 2006).

Plag, H.-P., The concepts in sea level studies: A detailed analysis of errors, Understanding Sea-level Rise and Variability, A World Climate Research Programme Workshop and a WCRP contribution to the Global Earth Observation System of Systems, UNESCO/IOC, Paris (June 2006).

Plag, H.-P., GEO, GEOSS and IGOS-P: The framework of global Earth observations, Invited, IAG/ International GNSS Service, Darmstadt, Germany (May 2006).

Plag, H.-P., GGOS progress towards an interaction with IGOS-P, Invited, IAG/GGOS, Munich, Germany (February 16, 2006).

Plag, H.-P. User requirements for GGOS, Invited, IAG/GGOS, Munich, Germany (February 15, 2006).

Plag, H.-P., GEO and GEOSS: A brief background, Invited, IAG/GGOS, Munich, Germany (February 14, 2006).

Plag, H.-P., GEO, GEOSS, and IGOS-P User Requirements, Invited, IAG/GGOS, Munich, Germany (February 14, 2006).

Plag, H.-P., Bingly, R.M., Teferle, F.N., Kierulf, H.P., Williams, S.P.D., and Hammond, W.C., Reference-frame induced uncertainties in measurements of vertical land motion at tide gauges: A case study for the European tide gauge network of the ESEAS, International Association of Geodesy, Geodetic Reference Frame Symposium, Munich, Germany. (October 9, 2006).

Plag, H.-P., and Hammond, W.C., Requirements for global reference frame stability: The cases of global and local

sea level studies, IAG Geodetic Reference Frame Symposium, International Association of Geodesy, Geodetic Reference Frame Symposium, Munich, Germany (October 9, 2006).
Plag, H.-P., Hammond, W. C., Blewitt, G., and Kreemer, C. W., Vertical Motion Observed With GPS and InSAR in Nevada: What can we Learn about Geophysical Signals, Earth Structure, and Rheology?, Invited, American Geophysical Union, San Francisco. (December 2006).
Plag, H.-P., and Kreemer, C.W., Are post-glacial rebound model predictions consistent with the global space-geodetic secular velocity field?, Annual Assembly of the EGU, Vienna, Austria. (April 2006).
Plag, H.-P., Kreemer, C.W., and Lavallee, D., Towards a standard model for present-day signals due to postglacial rebound, Invited, SNARF Working Group, Denver, USA (March 15, 2006).
Plag, H.-P., Kreemer, C.W., Lavallee, D., and Blewitt, G., Reducing global reference frame uncertainties by geophysical models, Geodetic Reference Frames 2006 Symposium, International Association of Geodesy, Munich. (October 11, 2006).
Plag, H.-P., and Rothacher, M., Earth system dynamics: toward a theme proposal initiated by the Global Geodetic Observing System (GGOS) of the International Association of Geodesy (IAG), Invited, IGOS-P, Geneva (May 2006).
Plag, H.-P., Rothacher, M., Gross, R., and Bettadpur, S., The Global Geodetic Observing System (GGOS) of the International Association of Geodesy (IAG), Invited, Theme Leader Meeting, IGOS-P, Geneva (April 2006).
Plag, H.-P., Sahagian, D., and Cazenave, A., What do we need to know about mass transport and Earth dynamics for the nine benefit areas of GEO?, Invited, GGOS 2006 Workshop, IAG, Munich, Germany. (October 8, 2006).
Plag, H.-P., and ten others, The Global Geodetic Observing System: meeting the requirements of a global society on a changing planet in 2020, Invited, IGOS-P, Buenos Aires, Argentina (November 13, 2006).
Plag, H.-P., Ventura-Traveset, J., Toran, F., and Matur, A., A satellite-based communication channel for the reliable distribution of early warning messages: the alert interface via EGNOS (ALIVE) for disaster prevention and mitigation, Third Early Warning Conference, UNESCO/IDRS, Bonn, Germany (March 2006).
Price, J.G., 2006, Success in advocacy and communication of science: Geological Society of America Abstracts with Programs, v. 38, no. 7, p. 257.
Price, J.G., Geological issues facing Nevada: University of Nevada, Reno lecture for introductory geology class (December 11, 2006).
Price, J.G., Why there is so much gold in Nevada: Northwest Mining Association, Reno (December 7, 2006).
Price, J.G., Update on exploration and mining in Nevada: Northwest Mining Association, Reno (December 6, 2006).
Price, J.G., Geologic aspects of the Yucca Mountain project: Northwest Mining Association short course on uranium, Reno (December 5, 2006).
Price, J.G., Earthquakes in your county – probabilities and consequences: Nevada Association of Counties, Las Vegas (November 16, 2006).
Price, J.G., Geologic issues in southern Nevada: Workshop on Needs for Geoscience in Southern Nevada, Las Vegas (November 13, 2006).
Price, J.G., NBMG and geothermal resources: Nevada Geothermal Council, Reno (November 9, 2006).
Price, J.G., Mining's role in carbon dioxide sequestration: Northern Nevada Section of the Society for Mining, Metallurgy, and Exploration, Reno (October 13, 2006).
Price, J.G., Earthquake hazards in the west: Sierra Pacific Power Company and western utilities, Lake Tahoe (October 5, 2006).
Price, J.G., Loss-estimation modeling of earthquake scenarios: Humboldt County Commission and Winnemucca City Council (May 1, 2006).
Price, J.G., Preliminary assessment of the potential for carbon dioxide sequestration in Nevada: University of Nevada, Las Vegas (April 26, 2006).
Price, J.G., Loss-estimation modeling of earthquake scenarios: Town Board, Parhump, Nevada (April 25, 2006).
Price, J.G., Carlin-type gold deposits: International Masters' Program, Lima, Peru (April 4, 2006)
Price, J.G., Earthquake loss-estimation modeling: International Masters' Program, Lima, Peru (April 3, 2006).
Price, J.G., New Zealand geothermal systems: International Masters' Program, Lima, Peru (March 31, 2006).
Price, J.G., Loss-estimation modeling of earthquake scenarios for each county in Nevada: Preliminary Damage Assessment Team, State Safety Officers, Nevada Division of Emergency Management, Carson City (February 23, 2006).
Price, J.G., Loss-estimation modeling of earthquake scenarios for each county in Nevada: Nevada Earthquake

Safety Council, Las Vegas (February 8, 2006).
Price, J.G., Loss-estimation modeling of earthquake scenarios for each county in Nevada: University of Nevada, Reno (press release, February 7, 2006).
Price, J.G., Mining in Nevada: Eurasian mining delegation, Reno (February 6, 2006).
Price, J.G., Reducing risks from natural hazards: Mackay School of Earth Sciences and Engineering Advisory Board, Reno (February 2, 2006).
Price, J.G., Reducing risks from natural hazards: Nevada System of Higher Education, Reno (January 30, 2006).
Price, J.G., Geology of Nevada: Nevada State Museum, Carson City (January 26, 2006).
Price, J.G., Gold, water, and nuclear waste: University of Utah, Salt Lake City (January 19, 2006).
Rothacher, M., Plag, H.-P., and Neilan, R., Report of the chairs, Invited, IAG, Seventh Meeting of the GGOS Steering Committee, San Francisco (December 11, 2006).
Rothacher, M., Plag, H.-P., and Neilan, R., Report of the chairs, Invited, Fifth meeting of the GGOS Steering Committee, IAG, Vienna, Austria. (April 2006).
Rothacher, M., Plag, H.-P., and Neilan, R., The Global Geodetic Observing System (GGOS): a cornerstone for monitoring systems enabling early warning, Third Early Warning Conference, UNESCO/IDRS, Bonn, Germany. (March 2006).
Rothacher, M., Plag, H.-P., and Neilan, R., Report of the Chairs, Invited, IAG/GGOS, Munich, Germany. (February 15, 2006).
Shevenell, L., Modeling Undiscovered Geothermal Resources in the Great Basin with Spatial Analysis in a Geographic Information System (GIS), United States Geological Survey offices, Menlo Park, CA (Feb. 10, 2006, jointly prepared by Coolbaugh, Shevenell, and Raines, and presented by Coolbaugh).
Shevenell, L., Effects of geothermal waters on Nevada Drinking Water Supplies. Nevada Rural Water Association, Reno, NV (March 14-16, 2006).
Shevenell, L., Summary of research projects at the Great Basin Center for Geothermal Energy. Society of Independent Professional Earth Scientists, Lake Tahoe, NV (June 23, 2006, prepared by Shevenell, presented by Coolbaugh).
Shevenell, L., Geothermal research at the Great Basin Center for Geothermal Energy. Northwest Regional Meeting of the American Chemical Society, Reno, NV (June 27, 2006).
Shevenell, L., Update of Great Basin Center for Geothermal Energy Activities. Geothermal Resources Council. San Diego, CA (September 10-13, 2006, poster).
Shevenell, L., Bell, J.W., Blewitt, G., Calvin, W., Coolbaugh, M., Faulds, J.E., Garside, L.J., Gates, A., Hammond, W.C., Kratt, C., Kreemer, C.W., Lechler, P.L., Oppliger, G., Sladek, C., and Zehner, R.E., Update of the activities of the Great Basin Center for Geothermal Energy: 61st ACS (American Chemical Society) Northwest Regional Meeting (NoRM), June 25-28, 2006, Sparks, NV
Shevenell, L., Bell, J. W., and Blewitt, G., Summary of Research Projects at the Great Basin Center for Geothermal Energy, Society of Independent Professional Earth Scientists, South Lake Tahoe. (June 2006).
Shevenell, L., Bell, J. W., and Blewitt, G., Update of Great Basin Center for Geothermal Energy Activities, Geothermal Resources Council, San Diego. (September 2006).
Shevenell, L., Bell, J.W., Blewitt, G., Calvin, W., Coolbaugh, M., Faulds, J.E., Garside, L.G., Gates, A., Hammond, W.C., Kratt, C., Kreemer, C.W., Lechler, P., Oppliger, G., Sladek, C., and Zehner, R.E., 2006, Update of Great Basin Center for Geothermal Energy Activities: abstract with poster at Annual Meeting of the Geothermal Resources Council, San Diego, CA., Sept. 10-13, 2006.
Shevenell, L., Bell, J.W., Blewitt, G., Calvin, W., Coolbaugh, M., Faulds, J.E., Garside, L.G., Gates, A., Hammond, W.C., Kratt, C., Kreemer, C.W., Lechler, P.L., Oppliger, G., Sladek, C., and Zehner, R.E., 2006, Summary of Research Projects at the Great Basin Center for Geothermal Energy: Society of Independent Professional Earth Scientists (SIPES) Annual Meeting, June 21-24, 2006, South Lake Tahoe, NV.
Shevenell, L., Bell, J.W., Blewitt, G., Calvin, W., Coolbaugh, M., Faulds, J.E., Garside, L.G., Gates, A., Hammond, W.C., Kratt, C., Kreemer, C.W., Lechler, P.L., Oppliger, G., Sladek, C., and Zehner, R.E., 2006, Update of the activities of the Great Basin Center for Geothermal Energy: 61st ACS (American Chemical Society) Northwest Regional Meeting (NoRM), June 25-28, 2006, Sparks, NV.
Silver, P.G., Hahn, B.C., Kreemer, C.W., Holt, W.E., and Haines, A.J., 2006, Convergent margins, growing and shrinking continents, and the Wilson Cycle, Geological Society of America, Philadelphia.
Sturmer, D.M., and Faulds, J.E., 2006, Kinematics of left-lateral faulting in a dextral shear zone of shear – Preliminary assessment of the Olinghouse fault, northern Walker Lane, western Nevada, USA: Geological Society of America Specialty Meetings Abstracts with Programs, Backbone of Americas Meeting, Mendoza, Argentina, no. 2, p.

## PRESENTATIONS AND ABSTRACTS—2007

Arritt, C.M., HAZUS-MH: FEMA's Risk Assessment Tool for Hazard Identification and Mitigation, Nevada Geographic Information Society, South Lake Tahoe, Nevada (2007).

Arritt, C.M., FEMA HAZUS software training, Hazmat EXPLO 2007, Las Vegas, Nevada (2007).

Bell, J.W., Amelung, F., and Ferretti, A., 2007, Permanent scatterer InSAR: A high-resolution tool for detecting and analyzing aquifer-system response in heavily pumped groundwater basins in the arid western US (Invited paper) : Geological Society of America Abstracts with Program, Annual Meeting, v. 39, no. 6, p. 268.

Bell, J.W., Amelung, F., and Ferretti, A., 2007, The use of permanent scatterer InSAR in the detection and analysis of aquifer-system response to long-term and seasonal pumping and recharge: EOS Transactions, American Geophysical Union, Abstract G51C-0628.

Bell, J.W., and Ramelli, A.R., 2007, Active faults and neotectonics at geothermal sites in the western Basin and Range: Preliminary results: Geothermal Resources Council, Annual Meeting Abstracts, p.18.

Blewitt, G., 2007, Consistency of Earth rotation, gravity, and shape measurements (pp. 10). GFZ, Potsdam: Abstract Book of the GRACE Science Team Meeting.

Blewitt, G., 2007, Plate Boundary Observatory analysis using the ambizap GPS processing algorithm (pp. 17). Monterey, CA: EarthScope National Meeting Abstracts.

Blewitt, G., Ambizap 2.0 Software: All-in-one rapid analysis of GPS mega-networks, Invited, National Institute of Geophysics and Volcanology (INGV), Rome, Italy. (November 2007).

Blewitt, G., Ambizap: Fast easy GPS processing for >1000-station networks, Univesrity of Newcastle upon Tyne, Newcastle upon Tyne, UK. (May 2007).

Blewitt, G., Setting the Context of the Thesis: Geodetic Reference Frames in the Presence of Crustal Deformations, Public Doctoral Thesis Defense of Martin Lidberg,Chalmers University, Gothenberg, Sweden. (October 2007).

Blewitt, G., Ambizap 2.0 Software: All-in-one rapid analysis of GPS mega-networks, Invited, Chalmers University, Gothenberg, Sweden. (October 2007).

Blewitt, G., Meeting with NSF EarthScope Program Managers, Nevada Geodetic Laboratory, NSF, UNR, Reno, NV. (January 2007).

Blewitt, G., and Altamimi, Z., 2007, Providing a stable reference frame for observing the effect of global climate change on sea level. Frascati: Abstracts of The Global Geodetic Observing System (GGOS) Workshop.

Blewitt, G., and Kreemer, C. W., 2007, Mega-network GPS solutions: Producing a consistent, global-scale, and high-resolution view of plate tectonic stability, rotation, and deformation (Abstract G21B-0501, vol. 88, Fall Meet. Suppl.). Eos Transactions AGU.

Blewitt, G., Kreemer, C. W., Hammond, W. C., and Plag, H.-P., 2007, Toward broadband exploration of tectonic-magmatic Interactions: Demonstration of self-consistent, "all-in-one" rapid analysis of GPS mega-networks using the ambizap algorithm. Perugia, Italy: Abstracts of IUGG 2007.

Blewitt, G., Kreemer, C. W., Hammond, W. C., and Plag, H.-P., 2007, Real-time GPS design considerations for prediction and early warning, with application to tsunami warning systems and post-earthquake rapid response,. Central Washington University, Ellensburg, WA: Abstracts of the Real Time GPS Workshop 2007.

Blewitt, G., Kreemer, C. W., Hammond, W. C., and Plag, H.-P., 2007, Realizing the potential of GGOS for geohazard prediction and early warning. Frascati: Abstracts of The Global Geodetic Observing System (GGOS) Workshop.

Blewitt, G., Kreemer, C. W., Hammond, W. C., Plag, H.-P., et al., 2007, Toward real-time GPS for tsunami warning systems and post-earthquake damage assessment and emergency response. Frascati: Abstracts of The 3rd International Geohazards Workshop.

Blewitt, G., Kreemer, C. W., Hammond, W. C., and Plag, H.-P., Peggy Glick's VIP Tour, Nevada Geodetic Laboratory, University of Nevada, Reno, Reno, NV. (September 2007).

Blewitt, G., Price, J. G., Hammond, W. C., Kreemer, C. W., and Plag, H.-P., Geodetic monitoring of the Yucca Mountain region using GPS measurements, Invited, NHSE Cooperative Agreement Interim Progress Briefings, Department of Energy, Desert Research Institute. (January 18, 2007).

Castor S.B., 2007, North American REE deposits, in Rare Metals - Rare Earth Resources symposium, June 19 - 21, 2007: Society of Resource Geology Abstracts with Programs, Tokyo, Japan, p. 24-25.

Castor, S.B., Industrial minerals in Nevada - an update, Society of Mining and Metallurgical Engineers luncheon meeting, October 12, 2007.

Castor, S.B., and Bryan, D., 2007, Industrial minerals in Nevada - who gives a rat's ass or what to do the next time

metal prices crash: Geological Society of Nevada Newsletter, v. 22, no. 5, p. 3.
Castor, S.B., and Henry, C.D., 2007, Uranium deposits and potential in peralkaline calderas, NW Nevada and SE Oregon: Northwest Mining Association Annual Meeting, December 6, 2007.
Coolbaugh, M., Arehart, G., Faulds, J.E., Vikre, P., and John, D., 2007, Active geothermal systems and Pliocene and younger gold deposits of the Great Basin, USA: Regional controls and selenium concentrations as a clue to ore environment: Geological Society of America Abstracts with Programs, v. 39, no. 6, p. 197.
Cousens, B., Henry, C.D., and Pauley, B., 2007, The Lake Forest tuff ring, Lake Tahoe, California: Age and geochemistry of a post-arc phreatomagmatic eruption: Eos Transactions AGU, 88(52), Fall Meeting Supplement, Abstract V31B-0495.
Crossley, D., Hinderer, J., and Plag, H.-P., GGP and GGOS, GGOS Retreat 2007, IAG, Oxnard, California, USA (March 2007).
Delwiche, B.M., Faulds, J.E., and Henry, C.D., 2007, Late Oligocene paleotopography and structural evolution of the Pah Rah Range, western Nevada: Implications for constraining slip on the right-lateral Warm Springs Valley fault in the northern Walker Lane: Geological Society of America Abstracts with Programs, v. 39, no. 4, p. 15.
dePolo, C.M., 2007, Emphasizing safety and protection of personal property in an earthquake preparedness message. Risk communication, building codes, and consequneces: the future of earthquake safety in the U.S. Proceedings volume of the 2007 Western States Seismic Policy Council Annual Conference.
dePolo, C.M., Earthquakes, earthquake response, and preparedness, Washoe County Emergency Operating Center, Reno, 2007.
dePolo, C.M., Earthquakes, earthquake response, and preparedness, Volunteer Organizations in Disasters, 2007.
dePolo, C.M. and Garside, T.G., 2007, The 1914 Reno Earthquakes - Major Events within the Reno Metropolitan Area, Annual Meeting of the American Geophysical Union, San Francisco.
Digiacomo, P., and Plag, H.-P., Report of the Coastal Zone Community of Practice, GEO User Interface Committee meeting, Cape Town, South Africa. (November 26, 2007).
Faulds, J.E., and Henry, C.D., 2007, The Walker Lane strike-slip fault system: An incipient transform fault along the evolving Pacific - North American plate boundary: Ores and Orogenesis: A symposium honoring the career of William R. Dickinson, Arizona Geological Society Symposium Program with Abstracts, p. 125.
Faulds, J.E., and Perkins, M.E., 2007, Evidence for dextral shear along the western margin of the Carson Sink: The missing link between the central and northern Walker Lane, western Nevada: Geological Society of America Abstracts with Programs, v. 39, no. 4, p. 15.
Faulds, J.E., 2007, Cenozoic evolution of the northern Colorado River extensional corridor, southern Nevada and northwest Arizona: California State University, Desert Studies Consortium 2007 Guidebook, p. 108 (keynote address at the 2007 Desert Symposium, Zzyzx, California).
Faulds, J.E., and Henry, C.D., 2007, The Role of the Walker Lane in the Evolving Pacific – North American Plate Boundary: A Natural Laboratory for Analyzing the Birth of a Transform: Abstracts for Earthscope MARGINS/Geoswath workshop, Monterey, California.
Faulds, J.E., Tectonic evolution of the Walker Lane: An incipient transform fault, Keynote address at the MARGINS/Geoswath Workshop, Earthscope National Meeting, Monterey, California (March 26, 2007).
Faulds, J.E., Characterizing structural and tectonic controls of geothermal fields in the northwestern Great Basin through geologic and geophysical analyses: Nevada Petroleum Society monthly meeting (April 5, 2007).
Garside, L.J., Shevenell, L., and Morris, C.L., 2007, Nevada geothermal resources – 2007 update, Geological Society of American, Abstracts With Programs, v. 39, no. 5, p. 15.
Gross, R. G., Blewitt, G., Clarke, P. J., and Lavallée, D., 2007, Low-degree surface mass loads estimated from geodetic measurements and geophysical models (Abstract 04506, vol. 9, pp. 1 pp). Geophysical Research Abstracts.
Gross, R. J., Lavallée, D. A., Blewitt, G., and Clarke, P. J., 2007, Consistency of Earth rotation, gravity, and shape measurements. Perugia, Italy: Abstracts of IUGG 2007.
Gross, R. J., Lavallée, D. A., Blewitt, G., and Clarke, P. J., Consistency of Earth rotation, gravity, and shape measurements, GRACE Science Team Meeting, GFZ, Potsdam, Germany (October 2007).
Gupta, V., Cousens, B., and Henry, C.D., 2007, A mantle cross-section through western and central Nevada from young basaltic magmas in the Sierra Nevada and western Great Basin: Eos Transactions AGU, 88(52), Fall Meeting Supplement, Abstract V34A-07.
Hammond, W.C., Taking the pulse of the Earth, Earth Science Week field trip (October 20, 2007).
Hammond, W.C., Concepts of Maps, rocks and Geological Science, Glenshire Elementary School (October 3, 2007).

Hammond, W.C., Exploring the relationship between geothermal resources and geodetically inferred slip rates on faults in the Great Basin, UNR-Nevada Bureau of Mines and Geology seminar (September 10, 2007).
Hammond, W.C., Crustal Deformation across the Sierra Nevada, Northern Walker Lane, Basin and Range Transition, Western United States Measured with GPS, 2000-2004, UNR-Nevada Bureau of Mines and Geology seminar (May 16, 2007)
Hammond, W.C., Western U.S. tectonics using the Global Positioning System, UNR Geology 333 (April 24, 2007).
Hammond, W.C., Concepts of Maps and Spatial Awareness, Glenshire Elementary School (February 9, 2007).
Hammond, W.C., Using GPS to Study Active Tectonics of the Basin and Range Province, UNR Geology 730 (January 30, 2007).
Hammond, W.C., and Kreemer, C.W., 2007, Geodetic constraints on plate boundary control of Basin and Range extension, Invited, National Science Foundation, EarthScope National Meeting, Monterey, CA.
Hammond, W.C., Kreemer, C.W., and Blewitt, G., 2007, Block modeling of crustal deformation in the Northern Walker Lane, western Basin and Range, to improve estimates of seismic hazard (Abstract G43B-07, vol. 88, Jt. Assem. Suppl.). Eos Transactions AGU.
Hammond, W.C., Kreemer, C.W., and Blewitt, G., 2007, The Walker Lane: How complex is it? Geodetic and geologic strain in the western Basin and Range using enhanced block modeling algorithms (pp. 86). Monterey, CA: EarthScope National Meeting Abstracts.
Hammond, W.C., Kreemer, C.W., and Blewitt, G., Exploring the relationship between geothermal resources and geodetically inferred fault slip rates in the Great Basin, Geothermal Resources Council, Sparks, NV. (September 2007).
Hammond, W.C., Plag, H.-P., Blewitt, G., and Kreemer, C.W., 2007, Postseismic relaxation at the Central Nevada Seismic Belt observed with vertical GPS time series (Abstract G52A-04, vol. 88, Fall Meet. Suppl.). Eos Transactions AGU.
Hammond, W.C., Plag, H.-P., and Kreemer, C.W., 2007, Postseismic relaxation from remote earthquakes observed in non-linearity of southern Basin and Range/Yucca mountain GPS time series, Seismological Society of America, Kona, HI.
Hastings, J.T., 2007, ArcGeology field system: Geological Society of America Abstracts with Programs: v. 39, no. 6, p. 618.
Hastings, J.T., ArcGeology Field System (v1.2), Barrick Global GIS Meeting, Elko, Nevada (2007).
Hastings, J.T., Johnson, G.L., and Mauldin, J., 2007, Interactive GIS for Renewable Energy in Nevada, Governor Jim Gibbons' Nevada Renewable Energy Transmission Access Advisory Committee meeting, Carson City, Nevada (2007).
House, P.K., Presented research results at Bill Williams River Workshop, U.S. Fish and Wildlife Service, Phoeniz, Arizona (2007).
Hursh, J.P., Slide show: Backroads of Nevada, National Automobile Museum, Reno, Nevada (2007).
Hursh, J.P., Slide show: Historical Barns of Nevada, Soroptimists International – Reno Cowboy Poetry Festival, Reno, Nevada (2007).
Hursh, J.P., Slide show: Historical Barns of Nevada, Sparks Heritage Museum, Sparks, Nevada (2007).
Hursh, J.P., Slide show: Backroads of Nevada, Geography class, University of Nevada, Reno, Reno, Nevada (2007).
Johnson, G.L., Nevada Users Group – HAZUS, Nevada Geographic Information Society, South Lake Tahoe, Nevada (2007).
Katzenstein, K.W., Bell, J.W., and Watters, R.J., 2007, InSAR-identified bedrock compaction and subsidence associated with mine-dewatering in north-central Nevada: Geological Society of America Abstracts with Program, Annual Meeting, v. 39, no. 6, p. 269. Student presentation of funded project results.
Katzenstein, K.W., Bell, J.W., and Watters, R.J., 2007, InSAR identifies mine-dewatering associated bedrock compaction and subsidence in north-central Nevada: EOS Transactions, American Geophysical Union, Abstract G51C-0625. Student presentation of funded project results.
Katzenstein, K.W., Bell, J.W., Zhan, J., and Listerud, B., 2007, InSAR-identified bedrock subsidence associated with mine-dewatering in central Nevada: Nevada Water Resources Association, Annual Meeting. Student presentation of funded project results.
Kimbrough, D., Grove, M., Gehrels, G., Dorsey, R., House, P. K., Howard, K. A., Pearthree, P. A., Spencer, J. E., and Mahoney, B. (2007). Detrital Zircon Record of Colorado River Incision (23rd ed., vol. 88, pp. T41C-03). Washington, D.C.: Eos: Transactions of the American Geophysical Union, Joint Assembly Supplement.
Kreemer, C.W., Guest lecturer, Graduate seminar, Geology 697, UNR (December 4, 2007).

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Kreemer, C.W., Guest lecturer, Structure, tectonics, and Earth physics, Geology 332, UNR (April 24, 2007).

Kreemer, C.W., Guest lecturer, Advanced geology of Nevada and the Basin and Range, Geology 730, UNR

Kreemer, C.W., Guest speaker, Peggy Glick's "Sneaker Tour" with UNR donors and alumni (2007).

Kreemer, C.W., 2007, Finding the Defining the edges of stable North America: Reference frame effects versus real tectonics, Invited, American Geophysical Union, San Francisco.

Kreemer, C.W., New constraints on the motion and boundaries of the Sierra Nevada block and Colorado Plateau from continuous GPS velocities, UNR, Nevada Bureau of Mines and Geology seminar (December 5, 2007).

Kreemer, C.W., Hammond, W.C., and Blewitt, G., On the motion and geometry of the Sierra Nevada Great Valley micro-plate: Implications for Walker Lane tectonics, UNR, Nevada Bureau of Mines and Geology seminar (March 7, 2007).

Kreemer, C.W., and Blewitt, G., 2007, Finding and defining the edges of stable North America: Reference frame effects versus real tectonics (Abstract G21B-0500, vol. 88, Fall Meet. Suppl.). Eos Transactions AGU.

Kreemer, C.W., Blewitt, G., and Hammond, W.C., Continuous GPS velocities in the Intermountain West: New constraints on the motion of the Colorado Plateau, EarthScope National Meeting 2007, NSF, Monterey, California. (March 2007).

Kreemer, C.W., Hammond, W.C., and Plag, H.-P., 2007, Detection of postseismic relaxation from the 1999 Hector Mine earthquake in southern Basin and Range GPS time series, Invited, American Geophysical Union, Acapulco, Mexico.

Kreemer, C.W., Hammond, W.C., and Blewitt, G., 2007, New constraints on the motion and boundaries of the Sierra Nevada block and Colorado Plateau from continuous GPS velocities, Perugia, Italy: Abstracts of IUGG 2007.

LaPointe, D.D., Using topographic and geologic maps in the classroom, Invited, Clark County Math-Science T3 Conference, a K-12 teacher in-service workshop (January 26-27, 2007).

LaPointe, D.D., Classroom mineral-density activity, session as invited presenter at the Clark County Math-Science T3 conference, (January 26-27, 2007).

LaPointe, D.D., Rocks and minerals of Nevada, Nevada State Museum docent training session, Carson City (January 16, 2007).

LaPointe, D.D., Geology, Mining, and Minerals in Northern Nevada, Nevada State Museum docent training session, Carson City (September 25, 2007).

LaPointe, D.D., Mineral properties and exploration, UNR Honors Program outreach project, highlighting opportunities and encouraging traditionally underserved middle-school age girls to pursue careers in math and science (July 17, 2007).

LaPointe, D.D., Presented 20 short mineral activities to teachers, students, and other groups who toured the Mackay School of Earth Sciences and Engineering, 2006, including students, teachers, and parents from Nancy Gomes, Brown, Caughlin Ranch, Pine, Elmcrest, and Virgina Palmer Schools.

LaPointe, D.D., Gave 20 geological and career presentations off-campus to teachers, students, museum groups, and the general public, 2006.

Marsh, S., and Plag, H.-P., Transition of IGOS-P Themes into GEO, GEO Science and Technology Committee, Cape Town, South Africa. (December 1, 2007).

Muntean, J.L., 2007, Exploration for Carlin-type deposits in a mature terrain: maintaining Nevada's gold rush: Ores and Orogenesis, Arizona Geological Society Symposium 2007, Tucson, Arizona, September 2007, p. 123 (Invited Lecture).

Muntean, J.L., Controversies surrounding the origin of a quarter of the world’s annual gold production: the Witwatersrand of South Africa and the Carlin trend of Nevada, University of Kentucky Department of Earth and Environmental Sciences Rast-Holbrook Lecture Series (November 29, 2007), Lexington, Kentucky [Invited Lecture].

Muntean, J.L., Volcanoes and volcanic rocks, Brown Elementary School, Reno, Nevada (November, 1, 2007).

Muntean, J.L., Minerals, rocks, and gold exploration, Brown Elementary School, Reno, Nevada (May 30, 2007).

Muntean, J.L., Inversion tectonics in north-central Nevada: controls on the formation of lower plate windows and structural traps for Carlin-type gold deposits, Newcrest Mining’s Americas annual exploration meeting, (May 15, 2007) Reno, Nevada [Invited Lecture].

Muntean, J.L., The porphyry-epithermal transition: examples from the Maricunga belt, Newcrest Mining’s Americas annual exploration meeting, (May 15, 2007) Reno, Nevada [Invited Lecture].

Muntean, J.L., Sources, pathways, and depositional sites for hydrothermal fluids that form Carlin-type gold

deposits, Getchell district, Nevada, Mackay Seminars in Geology, University of Nevada, Reno (May 4, 2007) [Invited Lecture].
Muntean, J.L., The porphyry-epithermal transition: examples from the Maricunga belt, University of Nevada Las Vegas, Las Vegas, Nevada (April 26, 2007).
Muntean, J.L., Inversion tectonics in north-central Nevada: controls on the formation of lower plate windows and structural traps for Carlin-type gold deposits, University of Nevada, Las Vegas Geology Lecture Series, (April 25, 2007) [Invited Lecture].
Muntean, J.L., Tectonic and structural setting for Carlin-type gold deposits with a focus on recognizing reactivated basement faults, Newmont Mining Corporation geologists, Elko, Nevada (February 28, 2007) [Invited Lecture].
Neilan, R., Plag, H.-P., Rothacher, M., Ma, C., and Pearlman, M., 2007, The Global Geodetic Observing System, Abstracts of the AOGS Annual Meeting, Singapore, 2007. Singapore.
Othus, S., Ely, L. L., House, P. K., Safran, E., O'Connor, J. E., and Fenton, C. (2007). Comparison of Two Landslides and Related Outburst Flood Deposits and Their Effects on River Evolution, Owyhee River, Oregon (52nd ed., vol. 88, pp. H51E-0808). Washington, D.C.: EOS: Transactions of the American Geophysical Union, Fall Meeting Supplement.
Pace, D.W. and Muntean, J.L., 2007, Jurassic intrusion-related or Eocene Carlin-style mineralization, what brought the gold to Bald Mountain?: Geological Society of America, v. 39, n. 6, p. 626.
Patterson, L. M. and Muntean, J. L., 2007, District-Scale Distribution of Trace Elements across a Carlin-Type Gold District: Jerritt Canyon, Nevada: Ores and Orogenesis, Arizona Geological Society Symposium 2007, Tucson, Arizona, September 2007, p. 177.
Plag, H.-P., A GGOS clearing-house for geodesy: a proposal, 10th GGOS Steering Committee meeting, Perugia, Italy. (July 8, 2007).
Plag, H.-P., Global Geodetic Reference Frames: Report to ADC-5, Fifth GEO Architecture and Data Committee meeting, Washington, D.C. (September 11, 2007).
Plag, H.-P., GEO Architecture and Data Committee Task AR-07-03, Invited, 10th GGOS Steering Committee meeting, Perugia. (July 8, 2007).
Plag, H.-P., Geohazards Community of Practice and IGOS Geohazards Theme - Report to UIC, GEO User Interface Committee meeting, Washington, D.C.(August 2, 2007).
Plag, H.-P., GEOSS User Needs and System Performance Utility Proposed Functional Specifications, GEO User Interface Committee meeting, Washington, D.C.. (August 1, 2007).
Plag, H.-P., GEO Task AR-07-03: (GEO Architecture and Data Committee) status, including GGOS 2020 and the GEO/GGOS 2007 Workshop, Invited, 9th GGOS Steering Committee meeting, EGU, Vienna, Austria. (April 17, 2007).
Plag, H.-P., GEO User Interface Committee, Invited, 10th GGOS Steering Committee meeting, Perugia. (July 8, 2007).
Plag, H.-P., GEO User Interface Committee, GGOS Retreat 2007, IAG, Oxnard, Ca., 2007 (March 2007).
Plag, H.-P., GGOS, the GGOS 2020 process and the users of GGOS, Invited, EGU, GGOS 2020 Forum, Vienna, Austria. (April 17, 2007).
Plag, H.-P., GGOS 2020: comments on Chapter 7: integrated scientific and societal user requirements and functional specifications for GGOS, GGOS Retreat 2007, IAG, Oxnard, Ca., USA (March 2007).
Plag, H.-P., International Association of Geodesy (IAG) and IGOS-P Geohazards Theme input to the GEO summit report, First Meeting of the GEO Task Force 2 for the Ministerial Summit, Geneva, Switzerland (April 11, 2007).
Plag, H.-P., Preparation of the progress report to the ministerial summit, Invited, 10th GGOS Steering Committee meeting, Perugia, Italy. (July 8, 2007).
Plag, H.-P., Recent developments with respect to GGOS2020 and the IGOS-P Theme, Invited, GGOS Retreat 2007, IAG, Oxnard, Ca., USA. (March 2007).
Plag, H.-P., Recommendations for the Development of GGOS, Invited, EGU, GGOS 2020 Forum, Vienna, Austria. (April 17, 2007).
Plag, H. -P., Task AR-07-03: global geodetic reference frames, Invited, GEO Architecture and Data Committee meeting, Geneva, Switzerland. (February 2007).
Plag, H.-P., Task AR-07-03 of the GEO Work Plan 2007-2009, Invited, GGOS Retreat 2007, IAG, Oxnard, Ca., USA. (March 2007).
Plag, H.-P., 2007, Towards a future predictive non-linear terrestrial reference frame for improved geodetic monitoring of the global hydrological cycle, Eos Transactions, American Geophysical Union, Fall Meeting

Supplement, vol. 88, pp. G32A-06.
Plag, H.-P., 2007, Towards a future predictive non-linear terrestrial reference frame for improved early detection of geohazards and disaster mitigation, in Paganini, M. (ed.), The 2007 International Geohazards Week, p. 40, Frascati: European Space Agency.
Plag, H.-P., 2007, The Global Geodetic Observing System (GGOS): backbone for a solid earth observing system for geohazards assessment and disaster reduction, in Paganini, M. (Ed.), The 2007 International Geohazards Week, p. 67, Frascati: European Space Agency.
Plag, H.-P., The Global Geodetic Observing System (GGOS): contribution to IGOS-P and GEO, IGOS-P, Paris, France. (May 30, 2007).
Plag, H.-P., The Global Geodetic Observing System: meeting the requirements of a global society on a changing planet, Invited, GGOS Retreat 2007, IAG, Oxnard, Ca., USA. (March 2007).
Plag, H.-P., The Global Geodetic Observing System (GGOS): status and strategy, Meeting of the GLOSS Group of Experts, IOC, Paris, France. (June 7, 2007).
Plag, H.-P., Towards a future predictive non-linear terrestrial reference frame for improved early detection of geohazards and disaster mitigation, GEO/GGOS Workshop, Academic, IAG, IGOS-P, Frascati, Italy (November 5, 2007).
Plag, H.-P., Understanding vertical motion observed with GPS on local scales: Status and potential improvements?, Invited, UNR-Nevada Bureau of Mines and Geology seminar (May 5, 2007).
Plag, H.-P., Bockmann, L., Charlotte, B., Brocard, D., Berenger, X., and Chambre, E., Determination and Maintenance of Navigation Systems Reference Frames: The EGNOS Example, 1st Colloquium Scientific and Fundamental Aspects of the Galileo Programme, ESA, European Commission, Toulouse, France. (October 2007).
Plag, H.-P., Blewitt, G., and Herring, T.A., Towards a consistent conventional treatment of surface-load induced deformations, International Earth Rotation and Reference Frames Service, Paris, France. (September 2007).
Plag, H.-P., and Hammond, W.C., 2007, On the use of local sea level scenarios for managing and mitigating the impact of coastal inundation, Invited, American Geophysical Union, San Francisco, CA.
Plag, H.-P., and Hammond, W.C., Plausible local sea level scenarios in support of managing and mitigating the impacts of coastal inundation: How large are the uncertainties?, Invited, Chronic Risk of Global Climate Change to Urban Coasts and Economies, Stevens Institute of Technology and New Jersey Sea Grant, Hoboken, New Jersey. (November 15, 2007).
Plag, H.-P., Hammond, W.C., Kreemer, C.W., and Blewitt, G., 2007, Integrating Point and Image Geodesy: Mutual Benefits and Requirements, poster presented at The NRC Decadal Study DESDynI Science Workshop. Champions Gate, FL: Abstracts of the NRC Decadal Study DESDynI Science Workshop.
Plag, H.-P., Hammond, W.C., Kreemer, C.W., and Blewitt, G., 2007, Integrating Point and Image Geodesy: Mutual Benefits and Requirements, Abstracts of the NRC Decadal Study DESDynI Science Workshop, NASA, Champions Gate, Florida.
Plag, H.-P., Kreemer, C.W., and Hammond, W.C., Collocated absolute gravity measurements help to tie the geometric reference frame to the center of mass of the Earth system, International Union of Geodesy and Geophysics, Perugia, Italy. (July 2, 2007).
Plag, H.-P., Kreemer, C.W., and Hammond, W.C., 2007, Combination of GPS-observed vertical motion with absolute gravity changes constrain the tie between reference frame origin and Earth center of mass, National Science Foundation, EarthScope National Meeting, Monterey, CA.
Plag, H. -P., Kreemer, C. W., Hammond, W. C., and Blewitt, G., 2007, Vertical motion observed with GPS: What can we learn about regional geophysical signals, Earth structure, and rheology? (pp. p. 165). Monterey, CA: EarthScope National Meeting Abstracts.
Plag, H.-P., and Lilja Bye, B., GGOS vision, mission, and objectives: some ideas and suggestions, 11th GGOS Steering Committee meeting, Frascati, Italy. (November 4, 2007).
Plag, H.-P., and Lilja Bye, B., GGOS terms of reference: some ideas and suggestions, 10th GGOS Steering Committee meeting, Perugia, Italy. (July 8, 2007).
Plag, H.-P., Rummel, R., Sahagian, D., Rizos, C., Zumberge, J., Gross, R., Herring, T., Rothacher, M., and Beutler, G., The Global Geodetic Observing System: meeting the requirements of a global society on a changing planet in 2020, Invited, EGU, GGOS 2020 Forum, Vienna, Austria. (April 17, 2007).
Price, J.G., Great Basin Science Sample and Records Library: Nevada's efforts in data and sample preservation: Northwest Mining Association Final Program, p. 28 (2007).
Price, J. G., Geological issues facing Nevada, University of Nevada, Reno, Introductory geology class (December

10, 2007).
Price, J. G., and Coyner, A., Update on exploration and mining in Nevada, Northwest Mining Association, Spokane, Washington. (December 6, 2007).
Price, J. G., Nevada geologic $CO_2$ storage characterization, West Coast Regional Carbon Sequestration Partnership, Seattle, Washington. (November 27, 2007).
Price, J. G., Tribute to Ralph Roberts, Geological Society of Nevada, Reno. (October 19, 2007).
Price, J. G., Mining in Nevada, University of Nevada, Reno, Chinese mining delegation (October 17, 2007).
Price, J. G., Earthquakes in Nevada, Association of Environmental and Engineering Geologists, Reno. (October 17, 2007).
Price, J. G., Earthquake hazards in Nevada, Nevada Hazard Mitigation Planning Committee, Henderson, Nevada. (May 23, 2007).
Price, J. G., Mining's role in carbon dioxide sequestration, Northeastern Nevada Section of the Society for Mining, Metallurgy, and Exploration, Winnemucca. (February 8, 2007).
Rothacher, M., Neilan, R., and Plag, H.-P., 2007, The Global Geodetic Observing System, in Paganini, M. (Ed.), The 2007 International Geohazards Week, p. 32, Frascati: European Space Agency.
Rothacher, M., Neilan, R., and Plag, H.-P., Status of GGOS, Invited, GGOS, 11th GGOS Steering Committee meeting, Frascati, Italy. (November 4, 2007).
Rothacher, M., Neilan, R., and Plag, H.-P., Status of GGOS, Invited, 12th GGOS Steering Committee Meeting, AGU Fall Meeting, San Francisco. (December 12, 2007).
Rothacher, M., Neilan, R., and Plag, H.-P., Status of GGOS, Invited, 9th GGOS Steering Committee meeting, EGU, Vienna, Austria. (April 17, 2007).
Roskowski, J. A., Patchett, P.J., Pearthree, P.A., Spencer, J.E., Faulds, J.E., and Reynolds, A.C., 2007, A late Miocene-early Pliocene chain of lakes fed by the Colorado River: Evidence from Sr isotopes of the Bouse Formation between Grand Canyon and Gulf of California: Geological Society of America Abstracts with Programs, v. 39, no. 6, p. 435.
Roskowski, J.A., Patchett, P.J., Spencer, J.E., Pearthree, P.A., Faulds, J.E., and Reynolds, A.C., 2007, A detailed strontium isotope study of the Bouse Formation, lower Colorado River, USA: Implications for Colorado River history: California State University, Desert Studies Consortium 2007 Guidebook, p. 112.
Safran, E.B., Anderson, S.W., Mills-Novoa, M., Othus, S., Ely, L.L., House, P.K., O'Connor, J.E., Grant, G., Fenton, C., and Beebee, R. (2007). Progressive Landslides in Uplifted Volcanic Plateaus: Persistent Loci of Channel Perturbation (52nd ed., vol. 87, pp. H53B-0623). Washington, D.C.: Eos: Transactions of the American Geophysical Union, Fall Meeting Supplement.
Shafroth, P.B., and House, P.K. (2007). Dynamics of Bottomland Geomorphology and Vegetation Along a Dammed, Arid Region River: Implications for Streamflow Management (23rd ed., vol. 88, pp. H44A-04). Washington, D.C.: Eos: Transactions of the American Geophysical Union, Joint Assembly Supplement.
Shevenell, L., New geothermal developments and better assessment of known geothermal areas through public/private partnerships in the Great Basin. PowerGen Conference, Las Vegas, NV (March 7, 2007).
Shevenell, L., Renewable energy projects at UNR. NSHE Regents meeting. Reno, NV, March 8, 2007.
Shevenell, L., Geothermal energy and the Great Basin Center for Geothermal Energy, Testimony presented to the Nevada State Senate Committee on Business and Industry (which handles energy bills) at the invitation of Senator Townsend, Carson City, NV (March 22, 2007).
Shevenell, L., Geothermal energy in the Western U.S.: potential for industry growth, Testimony presented at the U.S. Senate Committee on Energy and Natural Resources, Washington, D.C. (September 26, 2007).
Shevenell, L., 2007, Accomplishments of the Great Basin Center for Geothermal Energy, Geothermal Resources Council, Sept. 30 – Oct. 3, 2007, Sparks, NV.
Shevenell, L., Bell, J.W., Blewitt, G., Coolbaugh, M., Faulds, J.E., Hammond, W.C., Kreemer, C.W., Lechler, P.L., Louie, J., Oppliger, G., Plag, H.-P., Zehner, R.E., 2007, Accomplishments of the Great Basin Center for Geothermal Energy: Geothermal Resources Council Transactions, v. 31.
Shevenell, L., Bell, J.W., Blewitt, G., Coolbaugh, M., Faulds, J.E., Hammond, W.C., Kreemer, C.W., Lechler, P.L., Louie, J., Oppliger, G., Plag, H.-P., and Zehner, R.E., Geothermal research at the Great Basin Center for Geothermal Energy, Geothermal Resources Council annual meeting, Reno, NV, September 30-October 3, 2007 (poster).
Shevenell L., and Coolbaugh, M., 2007, New geothermal developments and better assessment of known geothermal areas through public/private partnerships in the Great Basin: abstract submitted for 4th annual Power Gen Renewable Energy and Fuels (PGRE&F) conference, "Power Gen 2007", March 6-8, 2007, Las Vegas, NV.

Sturmer, D.M., Faulds, J.E., and Perkins, M.E., 2007, Kinematic evolution of the Olinghouse fault in the northern Walker Lane: A left-lateral fault zone in a region of dextral shear: Geological Society of America Abstracts with Programs, v. 39, no. 4, p. 15.

Su, F., Kreemer, C.W., and Zheng, Y., Seismic hazard estimation based on GPS observations in the Basin and Range, Seismological Society of America, Kona, HI (April 12, 2007).

Vice, G.S., Faulds, J.E., Ehni, W.J., and Coolbaugh, M.F., 2007, Characterizing the structural controls of the Terraced Hills-Astor Pass geothermal system, northwestern Nevada: Geological Society of America Abstracts with Programs, v. 39, no. 5, p. 34.

Williams, A., Buck, B. J., Merkler, D., House, P. K., Howell, M., Morton, J., Robins, C., and Yonovitz, M. (2007). Alluvial fan flood hazard assessment: A comparison of FEMA, NRCS, and surficial geological maps in Ivanpah Valley, Nevada (Abstract 1625). New Orleans, LA: ASA-CSSA-SSSA International Annual Meeting Abstracts with Program.

Zehner, R., Robinson, C., Coolbaugh, M., and Shevenell, L., GIS Techniques in locating geothermal resources. Association of American Geographers (April 19, 2007).

Zeng, Y., Shen, Z., and Kreemer, C.W., Western US crustal strain rate map based on GPS observations, Seismological Society of America, Kona, HI (April 12, 2007).

## HONORS AND AWARDS – 2006 AND 2007

**Arritt, C.M.**

Recipient of the Diane Bryan Scholarship Award, an endowment established to support single parents seeking educational opportunities in minerals education, University of Nevada, Reno.

**Bell, J.W.** and **Ramelli, A.R.**

The paper by J.W. Bell and A.R. Ramelli titled “Active faults and neotectonics at geothermal sites in the western Basin and Range: Preliminary results” was awarded a GRC Best Paper Award for its contribution to the technical session on “Faults” at the 2007 Geothermal Resources Council Meeting.

**dePolo, C.M.** and **Bell, J.W.**

The following paper was selected as the 2006 Paper of the Year by the Association of Environmental and Engineering Geologists: dePolo, C.M., Bell, J.W., Boron, S., Slemmons, D.B., and Werle, J.L., 2006, Latest Quaternary fault movement along the Las Vegas Valley fault system, Clark County, Nevada: Environmental and Engineering Geoscience Journal, v. XII, no. 2, p. 181-193.

**Faulds, J.E.**

The paper by J.E. Faulds titled "Characterizing structural controls of geothermal fields in the northwestern Great Basin: a progress report" won best paper award in a session at the Geothermal Resources Council Annual Meeting, 2006.

Received the Mackay Faculty Achievement Award for 2006 from the Mackay School of Earth Sciences and Engineering.

**Henry, C.D.**

The Society of Economic Geologists awarded the Brian J Skinner Award for the best paper in *Economic Geology* in 2006 to M.W. Ressel and C.D. Henry, citing “technical excellence, innovation, and impact on the science of economic geology” for their paper: Ressel, M.W., and Henry, C.D., 2006, Igneous geology of the Carlin trend, Nevada: Development of the Eocene plutonic complex and significance for Carlin-type Gold deposits: Economic Geology, v. 101, p. 347-383. Mentored by Chris Henry, Mike Ressel earned his Ph.D. in UNR’s Department of Geological Sciences and Engineering.

**House, P.K.**

Received the Boggess Award of the American Water Resources Association in 2006. Established in 1973, this award is given to the author or authors of a paper published in the *Journal of the American Water Resources Association* during the preceding year, which best describes, delineates, or analyzes a major problem or aspect of water resources from a theoretical, applied, or philosophical standpoint: House, P.K., 2005, Using geology to improve floodplain management on alluvial fans—an example from Laughlin, Nevada. Journal of the American Water Resources Association, v. 41, n. 6., p. 1431-1447.

**Hursh, J.P.**

History Advocate Award for *Truckee Meadows Remembered*, City of Reno's Historical Resources Commission, Reno, Nevada.

**Muntean, J.L.**

Elected as a Councilor of the Society of Economic Geologists, 2006.

Elected as the Chair of the 2012 Gordon Research Conference on Geochemistry of Ore Deposits and the Vice Chair of the 2008 conference, 2006.

**Plag, H.-P.**

Fellow of the International Association of Geodesy (IAG), 2007

**Price, J.G.**

Received the Mackay Faculty Service Award for 2006 from the Mackay School of Earth Sciences and Engineering.

**Shevenell, L.**

Received the 2006 Mackay Faculty Achievement Award from the Mackay School of Earth Sciences and Engineering for dedication and service as Director of the Great Basin Center for Geothermal Energy.

Nominated by State Assembly Speaker Barbara Buckley and appointed by Governor Kenny Guinn to serve of the Nevada Renewable Energy Task Force.

## OTHER PROFESSIONAL ACTIVITIES—2006 AND 2007

NBMG scientists are active professionally at local, state, regional, national, and international levels. Many frequently serve as peer reviewers of manuscripts published in refereed journals, of proposals submitted to funding agencies, and of tenure and promotion applications at other universities. NBMG employees also serve on numerous committees and assignments within the University of Nevada, Reno, College of Science, Mackay School of Earth Sciences and Engineering, and NBMG. The latter tasks include review of NBMG publications by other authors. Many NBMG staff members frequently respond to inquiries from consulting geologists, industry geologists, civil engineers, local governments, state agencies, federal agencies, and the general public about Nevada geology. Below is a partial list of additional professional service provided by NBMG staff.

**Arritt, C.M.**

Secretary, California/Nevada Chapter, Geospatial Information and Technology Association, 2006.
Representative for the College of Science, UNR Staff Employees' Council, 2006-07.
Secretary, UNR Staff Employees' Council, 2006-07.
Registration Chair, Nevada Geographic Information Society 17th annual conference, South Lake Tahoe, Nevada, 2007.

**Bell, J.W.**

UNR institutional representative for the Western North America InSAR (WInSAR) Consortium, overseeing the acquisition of free radar data for all UNR InSAR research provided by funding from NSF and NASA, 2006-07.
Member, Steering Committee for the Las Vegas Fissure Preserve; sponsored by the Association of Engineering Geologists, Las Vegas section, 2006-07.
Member of Nevada Quaternary Fault Working Group, 2007. This group conducted a 2-day workshop to evaluate the status of fault-hazard research in Nevada and to recommend areas for future research.
Participant, two-day Earthscope Geoframe Workshop on Walker Lane structure-tectonics, 2006.
Participant, two-day USGS/NBMG workshop on Needs for Geoscience in Southern Nevada as related to the Southern Nevada Public Lands Management Act.

**Blewitt, G.**

Chair, UNAVCO Inc. Membership Committee. (reviewing applications for membership to the UNAVCO scientific community-based organization, and providing recommendations to the Directors of UNAVCO Inc.), 2006-07.
Chair, NSF EarthScope Stable North America Reference Frame Working Group (developing a new geodetic reference frame for scientific and legal purposes in North America (USA and Canada) in collaboration with NSF EarthScope and national survey agencies, NGS and NRCan, and the International Association of Geodesy), 2006-07.
Chair, Special Session G12, Toward a Stable North America Reference Frame, American Geophysical Union Fall Meeting, San Francisco, 2007.
Chair, Special Session JGS003, Earthquake and Volcano Geodesy, International Union of Geodesy and Geophysics, Perugia, 2007.
Member, Board of Directors, International GNSS Service (providing direction and oversight to the IGS collaborative organization as a whole), 2006-07.
Workshop Organizer, NSF EarthScope workshops (two per year) on research and development of reference frames for the NSF EarthScope Plate Boundary Observatory, 2006-07.
Member, NASA REASoN Science Advisory Team (providing professional advice on the needs of scientific users as requested by the NASA REASoN project "Inter-Service Data Integration for Geodetic Operations (INDIGO)" hosted at Jet Propulsion Laboratory), 2006-07.
Member, NSF EarthScope Plate Boundary Observatory Extensional Siting Committee, (deciding on site locations for the EarthScope Plate Boundary Observatory in zones of tectonic extension (the Great Basin and the Rio Grande Rift) given various scientific, logistical, and cost factors), 2006-07.
Member, American Geophysical Union Fellows Committee, 2006-07.
Member, American Geophysical Union Geodesy Awards Committee, 2006-07.
Member, Executive Committee, International GNSS Service, 2007.
Member, International Association of Geodesy Sub-Commission 1.2 on Global Reference Frames, 2007.
Member, International GNSS Service Elections Committee, 2007.
Member, IGS Strategic Planning Committee, 2006-07.
Member, Promotion and Tenure Committee, College of Science, University of Nevada, Reno, 2006-07.

**Castor, S.B.**

Member, Education Committee, Geological Society of Nevada, 2006.

**dePolo, C.M.**

Organizer, joint meeting of the Nevada Earthquake Safety Council and the Utah Seismic Safety Commission, 2007.
Organizer and Convener, Nevada Quaternary Fault Working Group, 2007.
Co-Organizer, Conference on the Seismic Hazards of Southern Nevada (held in conjuction with the Cordilleran and Rocky Mountain Sections of the Geological Society of America in 2008), 2006-07.
Co-Chair, Research Committee, Nevada Earthquake Safety Council (presenting regular updates on earthquake

research at the quarterly meetings of the Council) 2006-07.
Representative for the State of Nevada at the 2006 National Earthquake Program Managers Meeting, Federal Emergency Management Agency, 2006.
Member, Basin and Range Province Committee, Western States Seismic Policy Council (reviewing policy statements and helping to set the committee's agenda, including a future rural earthquake disaster summit), 2006-07.
Assistant to the City of Reno in developing seismic hazard parameters for the City's risk study, 2007.
Co-Instructor, The Earth as a classroom - educational seismology for Nevada's classrooms (discussing earthquake hazards and faults in the UNR Seismological Laboratory program for Nevada high school teachers), 2007.
Member, Organizing Committee, Annual meeting of the Western States Seismic Policy Council, Reno, 2006-07.
Interviewed by KUNR public radio, High Desert Forum about the 1906 San Francisco Earthquake and its effects in Nevada, 2006.

**Faulds, J.E.,**

Chair, Scholarship Committee, Nevada Petroleum Society, 2006; Member, 2007.
Co-Chair, NSF-Funded EarthScope Workshop on the Walker Lane-Eastern California Shear Zone, Reno, 2006.
Field Trip Co-Leader, The plutonic-volcanic-hydrothermal system in the Searchlight area, emphasized as an ancient hydrothermal system exposed in cross section, Geothermal Resources Council, 2006.
Facilitator, Workshop on Geoscience Needs in Southern Nevada, Las Vegas, 2006.
UNR Host, Exxon-Mobil Recruiter, 2006.
Participant, DOE Geothermal Workshop (defining priorities and strategies for discovering and developing geothermal resources in the western U.S.), Reno, 2006.
Participant, EarthScope GeoFrame Workshop, St. Louis, Missouri (selecting focus areas within the U.S. for NSF's EarthScope Program), 2006.
Keynote Speaker and Participant, EarthScope Margins/Geoswath Workshop, Monterey, California (planning EarthScope activities in the western U.S.), 2007.
Field Trip Co-Leader, Lower Colorado River trough, and Keynote Speaker, Desert Symposium, California State University Desert Studies Consortium, 2007.
Chair, Symposium on the evolution of transform faulting and propagation of extension and volcanism: The west-northwest margin of the Basin and Range province at the Geological Society of America Cordilleran Section Meeting, Bellingham, Washington, 2007.
Field Trip Co-Leader, Brady's and Desert Peak geothermal fields in northwestern Nevada, Geothermal Resources Council, 2007.
Field Trip Leader, Structural controls of geothermal fields in the Carson Sink region, Vulcan Geothermal Company, 2007.

**Garside, T.M.**

Treasurer, Geological Society of Nevada 2010 Symposium, 2006-07.
Secretary, Nevada Hazard Mitigation Planning Committee, 2006-07.

**Hammond, W.C.**

Chair, Session on Geophysical Geodesy: Earthquakes, Crustal Deformation, Earth Rotation, Polar Motion, American Geophysical Union - Geodesy Section, Joint Assembly meeting in Acapulco, Mexico, 2007
Chair, Geodesy Section of the AGU Joint Assembly 2008 Program Committee, American Geophysical Union, 2007.
Conference Program Organizer, American Geophysical Union, Geodesy Section (coordinated judging of 85 student presentations in the Geodesy Sessions at the Fall Meeting), 2006.
Conference Program Organizer, American Geophysical Union, Geodesy Section (coordinated judging of 85 student presentations at the spring Joint Assembly meeting in Acapulco, Mexico), 2007.
Field Trip Leader, GPS measurement of crustal deformation in the western Basin and Range and Lake Tahoe area, for Nevada public school teachers, Teacher Education Accreditation Council (July 10, 2007).
Television interview on tsunami warning using GPS, Channel 8 ABC News, Reno TV (July 17, 2006).
Television interview on KTVN Reno television station regarding tsunami research done by the UNR geodesy team

after a large earthquake and tsunami in Java (April 3, 2007).
Member, Basin and Range Province Earthquake Working Group, Western States Seismic Policy Council (contributing to the U.S.G.S national probabilistic seismic hazard maps), 2006.
Member, EarthScope Plate Boundary Observatory Standing Committee (providing guidance to UNAVCO, Inc. and PBO staff for scientific questions effecting the observatory, such as instrumentation siting and prioritization), 2007.

**Henry, C.D.**

Editor, Revista Mexicana de Ciencias Geologicas, the publication of all geologic branches of UNAM, 2006-07.
Field Trip Co-Leader, Earth Science Week, 2007.

**Hess, R.H.**

Executive Secretary, State Mapping Advisory Committee, 2006-07.
Nevada Representative, National States Geographic Information Council, 2006-07.
Nevada Representative, Geographic Information System Council, Western Governors' Association, 2006-07.

**Hinz, N.H.**

Field Trip Co-Leader, Neogene basins of the Reno, Nevada area, Nevada Petroleum Society, 2007.

**House, P.K.**

Participant, Verde River Ecological Flows workshop, Nature Conservancy, 2007.
Provided on-site evaluation of erosion and sedimentation hazards on the western slope of Carson Range, McCleary Ranch, Washoe Valley, 2007.

**Hursh, J.P.**

Judge, Scenic Nevada Photo Contest, 2006.
Member, Board of Directors, and Tour Leader, Historic Reno Preservation Society, 2006-07.
President, Nevada Corral, Westerners International, 2007.

**Johnson, G.L.**

Treasurer, Nevada Geographic Information Society, 2006-07.
Instructor, University of Nevada, Reno, Intro to GIS, Spring Semester, 2006-07.
Instructor, University of Nevada, Reno, Intro to GIS, Fall Semester, 2006-07.
Instructor, University of Nevada, Reno, Advanced GIS, Fall Semester, 2006.
Instructor, University of Nevada, Reno, GIS Design Studio, Fall Semester, 2007.

**Kreemer, C.W.**

Organizer, Seminars on topics concerning Great Basin tectonics, UNR, Nevada Bureau of Mines and Geology, 2006-07.
Co-chair, Task Force VII of the International Lithosphere Program: Temporal and Spatial Changes of Stress and Strain, 2006-07.
Chair, Special session at American Geophysical Union Fall meeting: Short- and Long-Term Strain Accumulation and Transients, 2006.
Member, PBO Data Working Group, National Science Foundation, 2007.

**LaPointe, D.D.**

Chair, Scholarship Committee, Mackay School of Earth Sciences and Engineering, UNR, 2006-07.
Chair, Scholarship-Loan Committee, NV-Reno Section of the Women's Auxiliary of the American Institute of

Mining, Metallurgical, and Petroleum Engineers, 2006-07.
Co-Chair, Scholarship Committee, National Board of the Women's Auxiliary of the American Institute of Mining, Metallurgical, and Petroleum Engineers, 2007.
Director, Geological Society of Nevada Foundation, 2006-07.
Organizer, Geological Society of Nevada Foundation fundraising events, Rock Raffle and Silent Auction, which raised more than $13,600 in 2006 and $15,000 in 2007 for the Foundation's educational projects Earth Science Field Trip Grant Program.
Co-chair of the Education Committee, Geological Society of Nevada, 2006-07.
Coordinator, Earth Science Field Trip Grant Program, Geological Society of Nevada (providing more than $8700 in grants in 2006 and $14,000 in 2007 to Nevada K-12 teachers for transportation on Earth science-related field trips).
Interim Secretary, Geological Society of Nevada, 2007.
Member, Education Committee, Nevada Mining Association.
Instructor, Master Teacher Track Sessions, Minerals Education Workshops, Nevada Mining Association, Las Vegas, 2006; Carson City, 2006; Las Vegas, 2007; Elko, 2007.
Field Trip Leader, Minerals Education Workshops, Nevada Mining Association, Las Vegas, 2006 (two trips); Carson City, 2006 (two trips); Las Vegas, 2007 (two trips), Elko, 2007 (two trips).
Coordinator, Earth Day booth, Nevada Mining Association (helping about 500 attendees from the community make concrete pavers), 2006 and 2007.
Field Trip Leader, Earth Science Week, 2006 and 2007 (two one-day trips for the general public each year).
Instructor, Churchill County Museum K-12 teacher professional development workshop session (April 4, 2006).
Field Trip Leader, UNR College of Engineering Summer Earthquake Engineering Camp, 2006 and 2007.
Field Trip Co-Leader, Twin Creeks Gold Mine, Washoe County high school field trip (April 2, 2006).
Exhibitor, Pine Middle School Gifted and Talented Resource Open House (March, 2006).
Instructor, Westergard Elementary School Family Science Night (March, 2006).
Organizer and Exhibitor, Jessie Beck Elementary School Family Science Night (March, 2006).
Organizer and Exhibitor, Galena High School Career Fair (March 10, 2006).
Coordinator, Rocks and Minerals Event, Nevada Science Olympiad Competition, Western Nevada Community College, Carson City (March 25, 2006).
Coordinator, Women in Science Presentation by Dr. Margie Chan from the University of Utah and showing of the film "Women Who Walk Through Time", UNR (April 7, 2006).
Volunteer, Minerals display, Incline Village Library, 2006.
Organizer and Exhibitor, Reno Gem and Mineral Society Jackpot of Gems Mineral Show (May 5-7, 2006).
Organizer, "Keck Kit" mineral-properties activity, Carson City Children's Museum Kids Karnival (August, 2006).
Co-Organizer, Governor's Tin Cup Tea museum fundraiser, W. M. Keck Museum, Mackay School of Earth Sciences and Engineering, 2006 and 2007.
Coordinator, State Earth Science Information Center, U.S. Geological Survey, 2006.
Coordinator, Nevada EarthCache and GeoCache public Earth-science educational project, 2006-07.
Instructor and Field Trip Leader, Nevada Earth / Space Science Initiative (NESSI) workshop and field trips, Reno, Lassen Volcanic National Park, Winnemucca, and Phoenix Mine, (June 17 –June 29, August 25, and September 8, 2007).
Field Trip Leader, Sites of geological interest in the Reno area, for prospective UNR students (April 16, 2007).
Organizer and Field Trip Co-Leader, Twin Creeks Gold Mine, Washoe County high school field trip (May 23, 2007).
Presenter, Grade-appropriate, standards-based, hands-on Earth-science activities to student/parent /teacher groups and Science Night events at Westergard and Anderson Elementary Schools.
Instructor, Sierra Nevada Academy field trip to Washoe Lake State Park (May 21, 2007).
Organizer and Exhibitor, Minerals activity, Galena High School Career Fair (March 10, 2007).
Organizer and Exhibitor, Children's mineral activity, Reno Gem and Mineral Society Jackpot of Gems Mineral Show, May 11-13, 2007.
Organizer, Keith Papke memorial endowment fundraiser at the May, 2007 meeting of the Geological Society of Nevada, UNR Foundation (May 18, 2007).

**Lechler, P.J.,**

Member, Laxalt Mineral Engineering/Laxalt Mineral Resources Space Review Committee, UNR, 2006.

Chair, Space Recommendation Committee, Mackay School of Earth Science and Engineering, UNR, 2006-07.
Chair, Analytical Equipment Committee, Mackay School of Earth Science and Engineering, UNR, 2006-07.
Participant, Project on Sustainable use of Platinum Group Elements in the 21st Century, International Geological Correlation Program.
Member, Abandoned Mine Lands Task Force, U.S. Bureau of Land Management, 2006-07.
Member, Nevada Attorney General's Mining Fraud Task Force, 2006-07.
Unpaid consultant and expert witness on mining fraud cases, U.S. Bureau of Land Management, Las Vegas, NV, 2006; U.S. Bureau of Land Management and Nevada Secretary of State, Reno, NV, 2007; Federal Bureau of Investigation, Las Vegas, NV, 2006.
Adjunct Professor, Western Carolina University, 2006-07.

**Mauldin, J.**

Member, Web Subcommittee, Nevada Geographic Information Society, 2006-07.
Designer, Carson City Bicycle Route Map – 2007 edition.
Webmaster, Friends of Silver Saddle Ranch.
Volunteer, Carson Valley Trails Association.

**Muntean, J.L.**

Field Trip Co-Leader, Spring field trip, Geological Society of Nevada, 2006.
Councilor, Society of Economic Geologists, 2006-07.
Chair, Medal Committee, Society of Economic Geologists, 2007.
Mentor, Society of Economic Geologists on-line mentoring program, 2006-07.
Advisor, UNR Student Chapter, Society of Economic Geologists
Chair, 2012 Gordon Research Conference on Geochemistry of Ore Deposits, 2006-07.
Vice Chair, 2008 Gordon Research Conference on Geochemistry of Ore Deposits, 2006-07.
Peer Review Panelist, Mineral Resources External Research Program, U.S. Geological Survey, 2007.

**Plag, H.-P.**

Vice-Chair, Steering Committee, International Association of Geodesy, Global Geodetic Observing System, 2006-07.
Co-Editor-in-Chief, Physics and Chemistry of the Earth, 2006-2007.
Member, Editorial Board, Journal of Geodynamics, 2006.
Chair, GEO Work Plan Task AR-07-03, 2007.
Member, GEO User Interface Committee, 2006-07.
Member, GEO Working Group on Tsunami Activities, 2006.
Member, GEO Architecture and Data Committee, 2007.
Member, Geological Applications of Remote Sensing (GARS) and IGOS-P Geohazards Joint Steering Committee. 2006-07.
Chair and Workshop Organizer, GGOS Workshop Program Committee, 2006-07.
Co-Convener of the Session G4/GD17 What constraints do Earth rotation, shape and gravity measurements place on the dynamical processes of the solid Earth? at the EGU Meeting in Vienna, Austria.
Co-Convener of the Session G4: The Global Geodetic Observing System: providing constraints on the mass movement in the Earth system at the AGU Fall Meeting in San Francisco, 2007.
Organizer of the GGOS 2020 Forum at the EGU Meeting in Vienna, Austria, 2007.
Member, Third IGOS-P Geohazards Workshop Program Committee, 2006-07.
Senator, UNR Faculty Senate, 2006-07.
Member, Task force on non-traditional faculty, UNR Faculty Senate, 2006-07.
Member, Executive Board, UNR Faculty Senate, 2007.
Member, Ad Hoc Group on Effort Reporting, UNR Faculty Senate, 2007.
Workshop Organizer, Costal Zone Community of Practice Workshop Steering Committee, 2007.

**Price, J.G.**

Secretary, Nevada Earthquake Safety Council, 2006-07.
Chair, State Hazard Mitigation Planning Committee, State of Nevada, Division of Emergency Management, 2006-07.
President, Association of American State Geologists Foundation, 2007.
President, Nevada Petroleum Society, 2006-07.
Secretary-Treasurer, Society for Mining, Metallurgy, and Exploration (SME) Foundation, 2006-07; Trustee, 2006-07.
Representative from SME Foundation on the Mining and Metallurgical Society of America – SME Foundation Presidential Scholarship Committee, 2007
Councilor, Geological Society of America, 2006-07.
Chair, Audit Committee, Geological Society of America, 2007; Member, 2006-07.
Chair, Nominations Committee, Geological Society of America, 2007; member, 2006-07.
Chair, Panel on Energy and Mineral Resources Position Statement, Geology and Public Policy Committee, Geological Society of America, 2006-07.
Member, Planning Subcommittee, State Hazard Mitigation Planning Committee, 2006-07.
Member, Annual Program Committee, Geological Society of America, 2006-07.
Member, Geology and Public Policy Committee, Geological Society of America, 2006-07.
Member, Executive Committee and Program Overview Committee, Geological Society of America, 2006-07.
Member, Working Group on Fugitive Mercury from Mining Operations, Nevada Division of Environmental Protection, 2007.
Chair, State Mapping Advisory Committee, 2006-07.
Administrator, Mining Cooperative Fund, State of Nevada, 2006-07.
Member, Federal Advisory Committee for the National Cooperative Geologic Mapping Program, U.S. Department of Interior, U.S. Geological Survey, 2006-07.
Member, Scientific Earthquake Studies Advisory Committee, U.S. Department of Interior, U.S. Geological Survey, 2006-07.
Field Trip Co-Leader, Earth Science Week, October 20-21, 2007.
Field Trip Co-Leader, Western States Seismic Policy Council, September 30, 2007.
Member, Review Panel, U.S. Bureau of Land Management Reclamation and Sustainable Mineral Development Awards Program, 2007.
Instructor and Field Trip Co-Leader, Nevada Mining Association Teachers' Workshop, Las Vegas, April 2007.
Instructor and Field Trip Co-Leader, Nevada Mining Association Teachers' Workshop, Elko, August 2007.
Member, Organizing Committee for the EarthScope National Meeting, Monterey, California, National Science Foundation, 2007 (and Co-Chair of session on Building a Continent in 4D: Integrating Geology into EarthScope)
Review Coordinator, National Research Council, for report on "Review of NIOSH Mine Safety and Health Research Program," 2006-07.
Chair, Honorary Members Committee, Association of American State Geologists, 2006-07.
Member, Hazards Committee, Association of American State Geologists, 2006-07.
Members, Mineral Resources Committee, Association of American State Geologists, 2006-07.
Member, Steering Committee for the Advanced National Seismic System (ANSS), U.S. Geological Survey, 2006.
Organizer, Nevada Petroleum Society field trip, July 18-24, 2006.
Organizer, Workshop on Needs for Geoscience in Southern Nevada, Las Vegas, November 13-14, 2006.
Instructor, Nevada Mining Association Teachers' Workshop, Las Vegas, April 10-12, 2006.
Instructor, Nevada Mining Association Teachers' Workshop, Carson City, August 8-10, 2006.
Instructor, Washoe County Emergency Operations Center earthquake exercise, July 13, 2006.
Field Trip Co-Leader, Earth Science Week, October 7 and 8, 2006.
Member, EarthScope Program Committee, National Science Foundation, 2006.
Review Coordinator, National Research Council, for report on "Mine Placement of Coal-Combustion Residues," 2006.
Member, Advanced National Seismic System (ANSS) Intermountain West Regional Advisory Committee, 2006.
Organizer, American Institute of Professional Geologists Geoscience Career Night, University of Nevada, Reno, October 16, 2006.
Chair, College of Science Bylaws Committee (completed its business in 2006).
Master of Ceremonies and Judge, Student Presentation Night, Association of Engineering Geologists, Las Vegas chapter, February 7, 2006.

Interviewed, along with Craig dePolo, by Guy Rocha in a one-hour KUNR Radio High Desert Forum about the 1906 San Francisco Earthquake and its effects in Nevada (March 24, 2006).
Interviewed on KUNR Radio regarding loss-estimation modeling of earthquake scenarios for each county in Nevada (March 14, 2006).
Interviewed on KOLO ABC television regarding earthquake hazards in Nevada and the 1906 San Francisco Earthquake (April 21, 2006).

**Ramelli, A.R.**

Participant, USGS Intermountain West Workshop for the U.S. National Seismic Hazard Maps May 31-June 1, 2006, Reno.
Participant, Nevada Quaternary Faults Working Group workshop, Nov. 19-20, 2007, Reno (included preparation of background reports for the Genoa, Mt. Rose, and Peavine faults).

**Shevenell, L.**

Technical Program Co-Chair for the 2006 Annual Geothermal Resources Council Meeting held in Reno, NV, September 10-13, 2006.
General Meeting Co-Chair and Technical Program Chair for the 2007 Annual Geothermal Resources Council Meeting held in Reno, NV, September 30-October 3, 2007.
Organizer and Host, DOE Geothermal Exploration Workshop, Reno, NV, December 4-5, 2006.
Member, Advisory Board, National Geothermal Assessment, U.S. Geological Survey, 2006.
Member, Nevada Geothermal Energy Technical Advisory Panel, Nevada Power, 2007.
Member, Annual Meeting Planning Committee, Geothermal Resources Council, 2007.
Judge, Geothermal Resources Council student paper awards. Reviewed and ranked 23 papers submitted to GRC by students from six countries, September, 2006.
Interviewed by Channel 2 News regarding the renewable energy plans discussed by Governor Gibbons and President Bush during the state of the state and state of the union addresses, January 23, 2007.
Interviewed by Nick Coltrain, News Editor of The Nevada Sagebrush regarding the Great Basin Center for Geothermal Energy and geothermal research, February 28, 2007.
Interviewed by Andrew Cristancho of the Sierra Sun Newspaper in Truckee regarding the basics of geothermal energy and its production, reliability, and environmental benefits, June 13, 2007.
Interviewed by Mark Taylor of the Geothermal Energy Association concerning exploration technologies and future directions and goals, July 16, 2007 for a GEA report on exploration.
Interviewed by Ben Kallo (Equity Research Associate) of Pacific Growth Equity for a report he was writing for an investor portfolio report related to geothermal energy, July, 2007.
Interviewed by Phoebe Sweet of the Las Vegas Sun concerning the geothermal industry, its health and role of the Great Basin Center for Geothermal Energy, September, 2007.
Interviewed by Pat Patera of Business Weekly about geothermal and the connection between the geothermal center and businesses, October, 2007.
Interviewed by James Yearling of High Country News (Colorado) about geothermal development in the state of Nevada, October, 2007.
Interviewed by Jim Strips of EDAWN (Economic Development of Western Nevada) for an article his was writing on geothermal potential in Nevada, July 18, 2007.
Member, Design Review Board for the Renewable Energy Center at the Redfield campus, UNR, 2006.
Member, Search Committee for Mackay School of Earth Sciences and Engineering Director, 2006.
Member, Special Hearing Committee, UNR, 2006.

# APPENDIX B

## STATUTORY MANDATES OF THE NEVADA BUREAU OF MINES AND GEOLOGY

## Nevada Revised Statutes related to the Nevada Bureau of Mines and Geology

### CHAPTER 514 - BUREAU OF MINES AND GEOLOGY

NRS 514.002 Definitions. As used in this chapter, unless the context otherwise requires, the words and terms defined in NRS 514.005 and 514.007 have the meanings ascribed to them in those sections.
(Added to NRS by 1997, 2977)

NRS 514.005 "Professional geologist" defined. "Professional geologist" means a person who:
1. Possesses a baccalaureate or higher degree from an accredited college or university with at least 30 semester hours or 45 quarter hours of course work in the science of geology and has at least 5 years of experience in the science of geology, which may include no more than 2 years of postgraduate course work in the science of geology;
2. Has at least 12 years of experience in the science of geology, at least 3 years of which must have been completed under the supervision of a professional geologist; or
3. Is currently licensed or certified as a professional geologist:
(a) In another state; or
(b) By a national nonprofit geological organization with members in at least 10 states who are licensed or certified, if the requirements for his current licensure or certification included requirements at least equal to those set forth in either subsection 1 or 2.
(Added to NRS by 1997, 2978)

NRS 514.007 "Science of geology" defined. "Science of geology" means the:
1. General study of the earth, including its origin, processes and history;
2. Collection and investigation of specimens of the constituent rocks, minerals, fossils, solids, mineralizing fluids, gasses and other materials of the earth that are located from the center of the core of the earth to the surface of the earth; and
3. Application of the knowledge set forth in subsections 1 and 2 for the benefit of the general public and the general welfare of this state.
(Added to NRS by 1997, 2978)

NRS 514.010 Establishment. There is hereby established a Bureau of Mines and Geology of the State of Nevada which shall be in the Public Service Division of the Nevada System of Higher Education.
[Part 1:127:1935; 1931 NCL § 4311.01]-(NRS A 1971, 368; 1993, 411)

NRS 514.020 Compensation and expenses of Board of Regents. Members of the Board of Regents shall serve without compensation, but shall be reimbursed for the actual expenses incurred in the performance of their official duties.
[Part 1:127:1935; 1931 NCL § 4311.01]

NRS 514.030 Employment and compensation of Director and other employees.
1. The Board of Regents of the University of Nevada shall appoint as Director a competent scientist or engineer, to be known as the Director of the Bureau of Mines and Geology, who must be a:
(a) Graduate of a recognized college or university with a degree in some branch of earth science or mineral engineering; and
(b) Professional geologist with expertise in the science of geology.
2. Upon the Director's nomination, the Board of Regents of the University of Nevada shall employ such assistants and employees as the Board deems necessary.
3. The Board of Regents of the University of Nevada may also determine the compensation of all persons employed by the Bureau of Mines and Geology and may remove them at will.
[Part 1:127:1935; 1931 NCL § 4311.01]-(NRS A 1971, 369; 1993, 411; 1997, 2978)

NRS 514.040 Duties. The Bureau of Mines and Geology shall:

1. Serve as a bureau of information and exchange on Nevada mineral industry, mineral resources and geology.
2. By questionnaire, field investigations, laboratory studies or otherwise, conduct a thorough survey of the mineral resources and geology of the State.
3. Apply geologic engineering principles to problems of conservation, environment, construction, mineral industry and other scientific matters that may be of importance to the welfare of the State.
4. Make studies of mineral materials to determine the most economical and practical methods of concentrating and processing these resources and to promote their conservation.
5. Collect, in collaboration with the Mackay School of Mines, a library and bibliography of all literature pertaining to Nevada mineral industry, geology and mineral resources.
6. Collect, in collaboration with the Mackay School of Mines, typical geological and mineralogical specimens and models, drawings and descriptions of appliances used in the mineral industry and earth science. Collections of these materials may be maintained and displayed elsewhere within or without the State.
7. Provide for the dissemination of information on the mineral industry, geology and mineral resources of the State through lectures and publications.
8. Consult with, advise, and assist state and local governmental agencies on geological problems of importance to the citizens of Nevada.
9. Consider such other kindred scientific and economic questions as in the judgment of the Board of Regents shall be deemed of value to the people of the State.

[2:127:1935; 1931 NCL § 4311.02]-(NRS A 1971, 369)

NRS 514.050 Cooperation of state departments. All departments of the State Government shall render full cooperation to the Bureau of Mines and Geology in the acquisition and compilation of all data required by NRS 514.040

[3:127:1935; 1931 NCL § 4311.03]-(NRS A 1971, 370)

NRS 514.060 Agreements with United States Geological Survey.

1. The Director of the Bureau of Mines and Geology, for and on behalf of the State of Nevada, with the approval of the Governor, is authorized to enter into agreements with the United States Geological Survey for cooperation in investigating mineral and geological conditions within the State and in the topographic and geologic mapping of Nevada. The expenses of such work must be divided between the parties upon a basis whereby the State of Nevada will not pay more than 50 percent of such expenses.
2. Money necessary to carry out the provisions of this section must be provided pursuant to NRS 519A.260.
3. All claims against such money must be approved by the Director of the Bureau of Mines and Geology, and, when thereafter approved by the State Board of Examiners, must be paid in the same manner as other claims against the State.

[1:40:1953] + [2:40:1953] + [3:40:1953]-(NRS A 1971, 370; 1995, 828)

NRS 514.070 Reports: Distribution and sale.

1. The Board of Regents shall cause to be prepared before September 1 of each even-numbered year a report covering the biennium ending June 30 of such year, showing the progress and condition of the Bureau of Mines and Geology, together with such other information as the Board may deem necessary or useful, or as the Board may require.
2. The regular and special reports of the Bureau of Mines and Geology shall be printed as the Board of Regents may direct, and the reports may be distributed or sold by the Board as the interest of the State or science may demand. All moneys obtained by the sale of such reports shall be retained by the Bureau of Mines and Geology to be used for costs of printing and distribution as the Board of Regents may direct.

[5:127:1935; 1931 NCL § 4311.05] + [6:127:1935; 1931 NCL § 4311.06]-(NRS A 1969, 1458; 1971, 370)

NRS 514.080 Unlawful acts. It shall be unlawful for the Director or any attaché of the Bureau of Mines and Geology:

1. To receive a commission or to act as agent or broker of or for any purchaser, owner, or his or their agents, of a mining property.
2. To act in any other than a wholly impartial way while so employed.

[4:127:1935; 1931 NCL § 4311.04]-(NRS A 1971, 370)

**CHAPTER 396 - UNIVERSITY AND COMMUNITY COLLEGE SYSTEM OF NEVADA**

**PUBLIC SERVICE DIVISION**

In General

NRS 396.600 Composition. The Public Service Division of the System consists of the following public service departments:

1. Agricultural Extension.
2. Agricultural Experiment station.
3. Bureau of Mines and Geology.
4. Such other departments as the Board of Regents may designate.

[1:98:1915; 1919 RL p. 3209; NCL § 7765] + [Part 2:98:1915; 1919 RL p. 3210; NCL § 7766] + [3:98:1915; 1919 RL p. 3210; NCL § 7767] + [5:98:1915; 1919 RL p. 3210; NCL § 7769]-(NRS A 1957, 766; 1959, 618; 1969, 1437; 1971, 368; 1985, 1125; 1993, 352)

NRS 396.610 Rules and regulations. All rules and regulations necessary for the proper administration and enforcement of the Public Service Division of the System must be made by the presidents, the chancellor and the Board of Regents.

[4:98:1915; 1919 RL p. 3210; NCL § 7768]-(NRS A 1969, 1438; 1993, 352)

**BUREAU OF MINES AND GEOLOGY**

NRS 396.620 Analyses of ores, minerals, soil and water: Submission of samples by residents of this state; fee; maintenance of records and samples.

1. Subject to the limitations specified in NRS 396.620 to 396.660, inclusive, the Chancellor shall cause to be analyzed by an appropriate employee of the System any ores, minerals, soil or water taken from within the boundaries of the State of Nevada and sent by any resident of the State for that purpose. Persons sending samples from post offices in states bordering Nevada may be required to furnish evidence that their samples are taken in Nevada and that they are Nevada residents. Any resident of the State may send any such substance for analysis. The report of the results of the analysis must be mailed to him within 10 working days after it has been received if he has supplied the information for the maintenance of records as provided in this section. The report sent to him must also contain as nearly as possible an explanation of the uses and market value of the substance.
2. For each sample sent for analysis, the System shall charge a fee of $5 which must be used to defray the expense of conducting the analysis and storing the sample.
3. The System shall keep a record, open for inspection, under such rules as may be made by the Board of Regents, of all minerals, ores or other matters so sent, with a history of the minerals or other matters, stating the name and residence of the person from whom received, as nearly as possible the location from which the material was taken, including the district and county, and any other relevant information. This information for the records may be required to be filed with the System before any work is done on the material sent, and the 10-day limit for reports will count from the time the information is received by the System. The System shall cause the preparation and printing of forms for providing the information and shall distribute the forms at no charge.
4. A portion of the sample analyzed must be kept by the System for 3 months after the report is sent out, in case any question should arise in relation to the report or additional information be desired. After that time expires, samples may be destroyed or used for any desirable purpose.

[1:84:1895; A 1931, 229; 1933, 147; 1931 NCL § 7754]-(NRS A 1969, 1526; 1981, 1715; 1985, 466; 1993, 352, 1597; 1995, 579; 1997, 20)

NRS 396.630 Assay to be run when same material sent from same district. If the same general kind of matter for analysis is sent from the same district and previous analyses have shown its character and values, it shall not be necessary to analyze the same, but an assay shall be run to determine the value thereof, and shall be sent by mail to the person desiring the same.

[2:84:1895; A 1933, 147; 1931 NCL § 7755]

NRS 396.640 Analyses of samples in order received. Samples for analysis shall be analyzed in the order received, as far as possible.

[3:84:1895; A 1933, 147; 1931 NCL § 7756]

NRS 396.650 Limitations on number of samples and quantitative analyses.

1. Gold and silver samples requiring assays and exact quantitative determinations are limited to two in any 30-day period; and of the so-called strategic or war minerals, such as antimony, arsenic, beryllium, manganese, magnesium, tungsten, molybdenum, quicksilver, zinc, lead, copper, tin, chromium, cadmium, or other strategic minerals for the assaying of which the average assay office is not equipped, there shall be run up to five assays or quantitative determinations for any single person or associated group of persons. Samples sent for ordinary rock and mineral determinations are limited to 10 in any 30-day period.
2. In order to save the State unnecessary expense, if preliminary examinations by microscope and qualitative tests indicate material of no economic value, exact quantitative analyses are not to be run on such samples, and reports on such material will indicate why such material has no commercial value.

[Part 4:84:1895; A 1897, 91; 1925, 29; 1931, 229; 1933, 147; 1943, 180; 1943 NCL § 7757]

NRS 396.660 Purpose and applicability of NRS 396.620 to 396.660 inclusive.

1. The main object of NRS 396.620 to 396.660, inclusive, as it relates to ore samples, is to aid the prospector in the discovery of new mineral deposits.
2. NRS 396.620 to 396.660, inclusive, shall not apply in the following cases:

(a) To operating mines. The term "operating mines" as used in this subsection means those properties milling or shipping ore or being worked by hired labor.
(b) To engineers sampling mines or prospects for purposes of valuation.
(c) To so-called "control assays" to check other assayers on ore known to be of value.

[Part 4:84:1895; A 1897, 91; 1925, 29; 1931, 229; 1933, 147; 1943, 180; 1943 NCL § 7757]

## CHAPTER 327 - NEVADA COORDINATE SYSTEM; GEOGRAPHIC NAMES

NRS 327.100 “Board” defined. As used in NRS 327.110 to 327.150, inclusive, unless the context otherwise requires, the term “board” means the Nevada State Board on Geographic Names.
(Added to NRS by 1985, 588)

NRS 327.110 Nevada State Board on Geographic Names: Creation; purpose. The Nevada State Board on Geographic Names is hereby created to coordinate and approve geographic names within the State for official recommendation to the United States Board on Geographic Names.
(Added to NRS by 1985, 588)

NRS 327.120 Nevada State Board on Geographic Names: Composition. The Board consists of:

1. One representative of each of the following agencies or organizations:
   (a) **Bureau of Mines and Geology of the State of Nevada.**
   (b) Faculty of the University of Nevada, Reno.
   (c) Faculty of the University of Nevada, Las Vegas.
   (d) State Library and Archives.
   (e) Department of Transportation of the State.
   (f) State Department of Conservation and Natural Resources.
   (g) Nevada Historical Society.
   (h) United States Bureau of Land Management.
   (i) United States Forest Service.
   (j) Inter-Tribal Council of Nevada, Inc.

Each agency or organization shall designate a representative and one alternative representative for this purpose.

2. An Executive Secretary who is a nonvoting member of the Board. The State Resident Cartographer shall serve in this position. If there is not such a cartographer, the voting members of the Board shall select the Executive Secretary.

(Added to NRS by 1985, 588; A 1993, 507)

NRS 327.130 Nevada State Board on Geographic Names: Officers; rules; quorum; meetings; compensation.

1. The Board shall designate from among its members a Chairman and a Vice Chairman and shall adopt rules for its own management.
2. A majority of the voting members of the Board constitutes a quorum for the transaction of business.
3. The Board shall meet at such times and places as are specified by the Chairman, but may not hold more than four meetings in any 1 year.
4. Members of the Board shall serve without compensation, travel expenses or subsistence allowances except as they may be provided by the members' respective agencies and organizations.

(Added to NRS by 1985, 588)

NRS 327.140 Nevada State Board on Geographic Names: Powers and duties.

1. The Board shall:
(a) Receive and evaluate all proposals for changes in or additions to names of geographic features and places in the State to determine the most appropriate and acceptable names for use in maps and official documents of all levels of government.
(b) Make official recommendations on behalf of the State with respect to each proposal.
(c) Assist and cooperate with the United States Board on Geographic Names in matters relating to names of geographic features and places in Nevada.
(d) Maintain a list of advisers who have special knowledge of or expertise in Nevada history, geography or culture and consult with those advisers on a regular basis in the course of its work.
2. The Board may:
(a) Adopt regulations to assist in carrying out the functions and duties assigned to it by law.
(b) Initiate proposals for changes in or additions to geographic names in the State. Any proposal initiated by the Board must be evaluated in accordance with the same procedures prescribed for the consideration of other proposals.

(Added to NRS by 1985, 588)

NRS 327.150 Changes in or additions of geographic names: Submission of proposal; preliminary consideration; final action and notice.

1. Any person, group or agency of federal, state or local government may propose a change in or the addition of any geographic name within the State by submitting it to the Board for evaluation and recommendation.
2. Upon receipt of any such proposal, together with sufficient supporting information, the Board shall:
(a) Place the proposal on the agenda for preliminary consideration at its next meeting.
(b) Give appropriate notice to persons and groups who are affected by the proposal or might have an interest in it.
(c) Provide opportunities for public comment.
(d) Conduct such research and field investigations as it deems necessary.
3. The Board may not take final action on any proposal until it has been given preliminary consideration at one or more previous meetings.
4. Whenever the Board takes final action on a proposal, it shall notify the person, group or agency who submitted the proposal and shall transmit the official recommendation to the United States Board on Geographic Names.

(Added to NRS by 1985, 589)

**CHAPTER 519A - RECLAMATION OF LAND SUBJECT TO MINING OPERATIONS OR EXPLORATION PROJECTS** (under the Division of Environmental Protection of the Department of Conservation and Natural Resources)

NRS 519A.260 Annual submission of reports and payment of fees by operator; disposition of money received.

1. Each operator shall, on or before April 15 of each year, submit to the Administrator a report relating to the status and production of all mining operations and exploration projects in which he has engaged and identifying each acre of land affected and land reclaimed by that mining operation or exploration project through the preceding calendar year, and shall pay to the division a fee of:

(a) One dollar and fifty cents for each acre of public land administered by a federal agency; and

(b) Five dollars and fifty cents for each acre of privately owned land, which has been disturbed by mining operations or exploration projects engaged in by the operator and not reclaimed.

2. **All money received by the State Treasurer pursuant to paragraph (a) of subsection 1 together with three-elevenths of all money received by the State Treasurer pursuant to paragraph (b) of subsection 1, up to a maximum of $100,000 annually, must be distributed directly to the Bureau of Mines and Geology of the State of Nevada to be used to carry out the provisions of NRS 514.060.** Any money in excess of the maximum and the balance collected pursuant to paragraph (b) of subsection 1 must be credited to the appropriate account for the division and used to administer the provisions of this chapter.

(Added to NRS by 1989, 1287; A 1991, 201)

## Nevada Administrative Code related to the Nevada Bureau of Mines and Geology

**CHAPTER 522 - OIL AND GAS** (under the Division of Minerals, Commission on Mineral Resources)

NAC 522.215 Cuttings: Requirements for permit; availability and use; notification of shortage. The taking of cuttings and the filing thereof is a condition for approval of the drilling permit, and this condition will be stated on the permit. **A minimum of two 15-milliliter sets of cuttings per sampling interval must be cleaned, dried and placed in sample envelopes, and the cuttings and a split of any core submitted to the bureau of mines and geology as soon as the drilling of the well is complete. The bureau shall remove a 15-milliliter set and place the set in permanent storage. The rest of the cuttings must be made available for public inspection and testing at that time or, if the records concerning the well are to be kept confidential pursuant to NAC 522.540, upon the expiration of the period of confidentiality. Destructive tests may be performed on the cuttings made available for public inspection and testing. The administrator of the division must be notified by the bureau of any sample envelopes containing less than 5 milliliters of cuttings.**

[Div. of Mineral Res., § 204, eff. 12-20-79]—(NAC A by Dep't of Minerals, 9-16-92)

NAC 522.510 Form 5: Well completion report.

1. Form 5, the well completion report, must be filed for all wells drilled in Nevada. In the case of a dry hole, this report may accompany Form 4. In the case of a well placed in commercial production, Form 5 must be filed with the division within 30 days after the well is placed in production. Only one Form 5 is required for each well. A second Form 5 is not required upon the abandonment of any producing well.
2. Two copies of all logging surveys run in the wellbore by the operator must be filed with the division. **The division will file one of the sets with the bureau of mines and geology. The copy at the bureau will be available for public inspection when the records are no longer confidential.**

[Div. of Mineral Res., § 707, eff. 12-20-79]—(NAC A by Dep't of Minerals, 7-22-87)

NAC 522.540 Confidentiality of well records.

1. Records concerning a well will not be kept confidential by the division unless the owner of the well requests confidentiality in writing or marks "confidential" on the logs of an exploratory well. Upon receiving such a request or log, the division will keep the records confidential for 6 months after their receipt unless the owner provides a written authorization for an earlier release.
2. An operator who plans to drill a series of exploratory wells within a given region or area may apply to the division to have the records for all his exploratory wells kept confidential. Such an application must specifically describe the area to be explored and the number and location of exploratory wells contemplated. Upon approval of the application, the administrator will keep all records of the project confidential for 6 months after receipt of the record. The operator may amend the plan of the project with the written approval of the administrator.

(Added to NAC by Dep't of Minerals, eff. 7-22-87)

**CHAPTER 534A - GEOTHERMAL RESOURCES** (under the Division of Minerals, Commission on Mineral Resources)

NAC 534A.310 Taking of cuttings is condition for approval; submission to bureau of mines and geology. The taking of cuttings at least every 30 feet, and filing thereof, is a condition for approval of the drilling permit. The cuttings must be cleaned, dried, marked for location and depth and placed in envelopes. **The cuttings and a split of any core must be submitted to the bureau of mines and geology of the State of Nevada within 30 days after the well is completed.**

(Added to NAC by Comm'n on Mineral Resources, eff. 11-12-85)

NAC 534A.550 Filing of report of completion and well logs.

1. Within 30 days after the completion of the construction of a well, the owner of the geothermal resource or the operator shall file with the division:

(a) A report setting forth the manner in which the well was completed.
(b) Two sets of all well logs.

2. **The division shall file one set of the well logs with the bureau of mines and geology of the State of Nevada.**

(Added to NAC by Comm'n on Mineral Resources, eff. 11-12-85; A 12-16-92)

NAC 534A.140 Hole logs: Subsurface information; confidentiality. Information about the subsurface obtained as a result of exploration drilling disclosed on hole logs as required by NAC 534A.130 must be filed with the state engineer within 30 days after it is acquired. **Such information together with other information concerning the exploration appearing on the logs and the cards containing the notice of intent to drill is confidential for a period of 5 years from the date of filing the cards or logs and must not be disclosed during that time without the express written consent of the driller's client.**

[St. Engineer, Exploration Drilling Reg. Art. VIII, eff. 12-13-77]

## United States Code (Federal Laws) related to the Nevada Bureau of Mines and Geology

**43 USC Sec. 31c** 01/26/98

TITLE 43 - PUBLIC LANDS

CHAPTER 2 - UNITED STATES GEOLOGICAL SURVEY

Sec. 31c. **Geologic mapping program**

STATUTE

(a) Establishment

(1) In general

**There is established a national cooperative geologic mapping program between the United States Geological Survey and the State geological surveys**, acting through the Association.

(2) Design, development, and administration

The cooperative geologic mapping program shall be -

(A) designed and administered to achieve the objectives set forth in subsection (c) of this section;

(B) developed in consultation with the advisory committee;

and

(C) administered through the Survey.

(b) Responsibilities of the Survey

(1) Lead agency

The Survey shall be the lead Federal agency responsible for planning, developing national priorities and standards for, coordinating, and managing the geologic mapping program. In carrying out this paragraph, the Secretary, acting through the Director, shall -

(A) develop a 5-year strategic plan for the geologic mapping program in accordance with section 31e of this title, which plan shall be submitted to the Committee on Resources of the House of Representatives and the Committee on Energy and Natural Resources of the Senate not later than 1 year after December 9, 1999;

(B) appoint, with the advice and consultation of the Association, the advisory committee not later than 1 year after December 9, 1999, in accordance with section 31d of this title; and

(C) not later than 3 years after December 9, 1999, and biennially thereafter, submit a report to the Committee on Energy and Natural Resources of the United States Senate and to the Committee on Resources of the House of Representatives identifying -

(i) how the Survey and the Association are coordinating the development and implementation of the geologic mapping program;

(ii) how the Survey and the Association establish goals, mapping priorities, and target dates for implementation of the geologic mapping program; and

(iii) how long-term staffing plans for the various components of the geologic mapping program affect successful implementation of the geologic mapping program.

(2) Responsibilities of the Secretary

In addition to paragraph (1), the Secretary, acting through the Director, shall be responsible for developing, as soon as practicable -

(A) in cooperation with the Association, other Federal and State agencies, public and private sector organizations and academia, the geologic-map data base; and

(B) maps and mapping techniques which achieve the objectives specified in subsection (c) of this section.

(C) Program objectives

The objectives of the geologic mapping program shall include -

(1) determining the Nation's geologic framework through systematic development of geologic maps at scales appropriate to the geologic setting and the perceived applications, such maps to be contributed to the national geologic map data base;

(2) development of a complementary national geophysical-map data base, geochemical-map data base, and a geochronologic and paleontologic data base that provide value-added descriptive and interpretative information to the geologic-map data base;

(3) application of cost-effective mapping techniques that assemble, produce, translate and disseminate geologic-map information and that render such information of greater application and benefit to the public; and

(4) development of public awareness of the role and application of geologic-map information to the resolution of national issues of land use management.

(d) Program components

(1) Federal component

(A) In general

**The geologic mapping program shall include a Federal geologic mapping component, the objective of which shall be to determine the geologic framework of areas determined to be vital to the economic, social, environmental, or scientific welfare of the United States.**

(B) Mapping priorities

For the Federal component, mapping priorities -

(i) shall be described in the 5-year plan under section 31e of this title; and

(ii) shall be based on -

(I) national requirements for geologic map information in areas of multiple-issue need or areas of compelling single- issue need; and

(II) national requirements for geologic map information in areas where mapping is required to solve critical earth science problems.

(C) Interdisciplinary studies

(i) In general

The Federal component shall include interdisciplinary studies that add value to geologic mapping.

(ii) Representative categories

Interdisciplinary studies under clause (i) may include -

(I) establishment of a national geologic map database under section 31f of this title;

(II) studies that lead to the implementation of cost- effective digital methods for the acquisition, compilation, analysis, cartographic production, and dissemination of geologic map information;

(III) paleontologic, geochrono-logic, and isotopic investigations that provide information critical to understanding the age and history of geologic map units;

(IV) geophysical investigations that assist in delineating and mapping the physical characteristics and 3-dimensional distribution of geologic materials and geologic structures; and

(V) geochemical investigations and analytical operations that characterize the composition of geologic map units.

(iii) Use of results

The results of investigations under clause (ii) shall be contributed to national databases.

(2) State component

(A) In general

**The geologic mapping program shall include a State geologic mapping component, the objective of which shall be to establish the geologic framework of areas determined to be vital to the economic, social, environmental, or scientific welfare of individual States.**

(B) Mapping priorities

For the State component, mapping priorities -

(i) shall be determined by State panels representing a broad range of users of geologic maps; and

(ii) shall be based on -

(I) State requirements for geologic map information in areas of multiple-issue need or areas of compelling single- issue need; and

(II) State requirements for geologic map information in areas where mapping is required to solve critical earth science problems.

(C) Integration of Federal and State priorities

A national panel including representatives of the Survey shall integrate the State mapping priorities under this paragraph with the Federal mapping priorities under paragraph (1).

(D) Use of funds

The Survey and recipients of grants under the State component shall not use more than 15.25 percent of the Federal funds made available under the State component for any fiscal year to pay indirect, servicing, or program management charges.

(E) Federal share

The Federal share of the cost of activities under the State component for any fiscal year shall not exceed 50 percent.

(3) Education component

(A) In general

The geologic mapping program shall include a geologic mapping education component for the training of geologic mappers, the objectives of which shall be -

(i) to provide for broad education in geologic mapping and field analysis through support of field studies; and
(ii) to develop academic programs that teach students of earth science the fundamental principles of geologic mapping and field analysis.

(B) Investigations

The education component may include the conduct of investigations, which -
(i) shall be integrated with the Federal component and the State component; and
(ii) shall respond to mapping priorities identified for the Federal component and the State component.

(C) Use of funds

The Survey and recipients of grants under the education component shall not use more than 15.25 percent of the Federal funds made available under the education component for any fiscal year to pay indirect, servicing, or program management charges.

(D) Federal share

The Federal share of the cost of activities under the education component for any fiscal year shall not exceed 50 percent.

-SOURCE-

(Pub. L. 102-285, Sec. 4, May 18, 1992, 106 Stat. 167; Pub. L. 103- 437, Sec. 16(a)(1), Nov. 2, 1994, 108 Stat. 4594; Pub. L. 105-36, Sec. 3(b), Aug. 5, 1997, 111 Stat. 1108; Pub. L. 106-148, Sec. 4,Dec. 9, 1999, 113 Stat. 1720.)

## APPENDIX C

### Customer Service Questionnaire

Dear patron of the Nevada Bureau of Mines and Geology (NBMG),

We've been asked by the University of Nevada, Reno's administration, for reporting to the Nevada Legislature, to provide performance measures on our products and service. In order to provide quantitative results, we've designed the following questionnaire. Please take a couple of seconds to answer the first question only or a few minutes to complete most or all of the form. Your participation will also allow us to serve you better by addressing any suggestions or concerns you may have. Thank you for your help.

Jon Price
State Geologist and Director

Please return the survey to:
Terri Garside
Executive Assistant
Nevada Bureau of Mines and Geology
University of Nevada, Reno/MS 178
Reno, NV 89557
or submit it by email to tgarside@unr.edu,
or fill out the questionnaire on the Web (www.nbmg.unr.edu).

Please rate the following items on a scale of A through F: A = outstanding, B = commendable, C = satisfactory, D = poor, and F = terrible. N/A = not applicable or don't know.

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**Overall Performance of the Nevada Bureau of Mines and Geology**

How well is the Nevada Bureau of Mines and Geology serving you? **A B C D F N/A**

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**NBMG Publications and Information Office** (Please see www.nbmg.unr.edu/sales/pbs.htm for a list of publications, www.nbmg.unr.edu/dox/dox.htm for free, on-line publications, and www.nbmg.unr.edu/infof.htm for other free information on the Web.)

Quality of NBMG publications: **A B C D F N/A**

Usefulness of the publications: **A B C D F N/A**

Number and variety of publications: **A B C D F N/A**

Quality of NBMG geologic maps: **A B C D F N/A**

Detail of NBMG geologic maps: **A B C D F N/A**

Current coverage of geologic maps: **A B C D F N/A**

Free publications on the Web: **A B C D F N/A**

Cost of publications for sale: **A B C D F N/A**

Customer service for sales: **A B C D F N/A**

Ease of Web sales: **A B C D F N/A**

Timeliness of receiving Web, mail, and fax orders: **A B C D F N/A**

Service from the Information Office: **A B C D F N/A**

Air photo coverage: **A B C D F N/A**

Content of mining district files: **A B C D F N/A**

Free mining-district, geothermal, and other information on the Web **A B C D F N/A**

Hours of operation: **A B C D F N/A**
(currently M-F, 7:30 a.m. to 3 p.m)

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**External Publications and Professional Service** (Please refer to NBMG's Biennial Reports for information on publications in other venues, including scientific journals, Geological Society of Nevada, Geothermal Resources Council, and Nevada Petroleum Society publications, and for information about professional service to geoscience organizations and the community by NBMG staff, www.nbmg.unr.edu/about.htm.)

External publications: **A B C D F N/A**

Professional service: **A B C D F N/A**

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**Outreach to the General Public, K-12 Teachers, and Students** (Please rate our publications for the general public, including the road guides, earthquake information, and other items in the Special Publication Series, www.nbmg.unr.edu/sales/pbs.htm, and items in our Educational Series, www.nbmg.unr.edu/dox/dox.htm; let us know how you like the Earth Science Week field trips; and tell us how well we answer your questions.)

Publications for the general public: **A B C D F N/A**

Earth Science Week field trips: **A B C D F N/A**

Helpfulness in answering questions: **A B C D F N/A**

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**Analytical Laboratory**

Quality of assays: **A B C D F N/A**

Cost of assays: **A B C D F N/A**

Turnaround time: **A B C D F N/A**

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**Suggestions to help us serve you better** (Feel free to answer any of these or other questions):

Are there any publications (maps, bulletins, reports, special publications, databases) that you would like to see NBMG prepare?

Are there any areas you'd like to see geologically mapped?

Are there any publications by publishers other than NBMG and the USGS that you would like us to sell?

What are your preferences for media for NBMG publications, including maps (paper only – purchased from us; paper – printed with customized GIS layers added; free on the Web – print your own; CD-ROM version)?

What other types of information and databases would you like to see in digital format free on the Web?

In what specific formats would you like digital information placed on the Web (e.g., pdf files, shapefiles, Access databases, spreadsheets)?

How would you prefer to see digital data organized on the NBMG Website?

If we were able to extend or change our office hours for the Publication Sales and Information Office, during which hours would you most likely visit or call?

Other suggestions or concerns?

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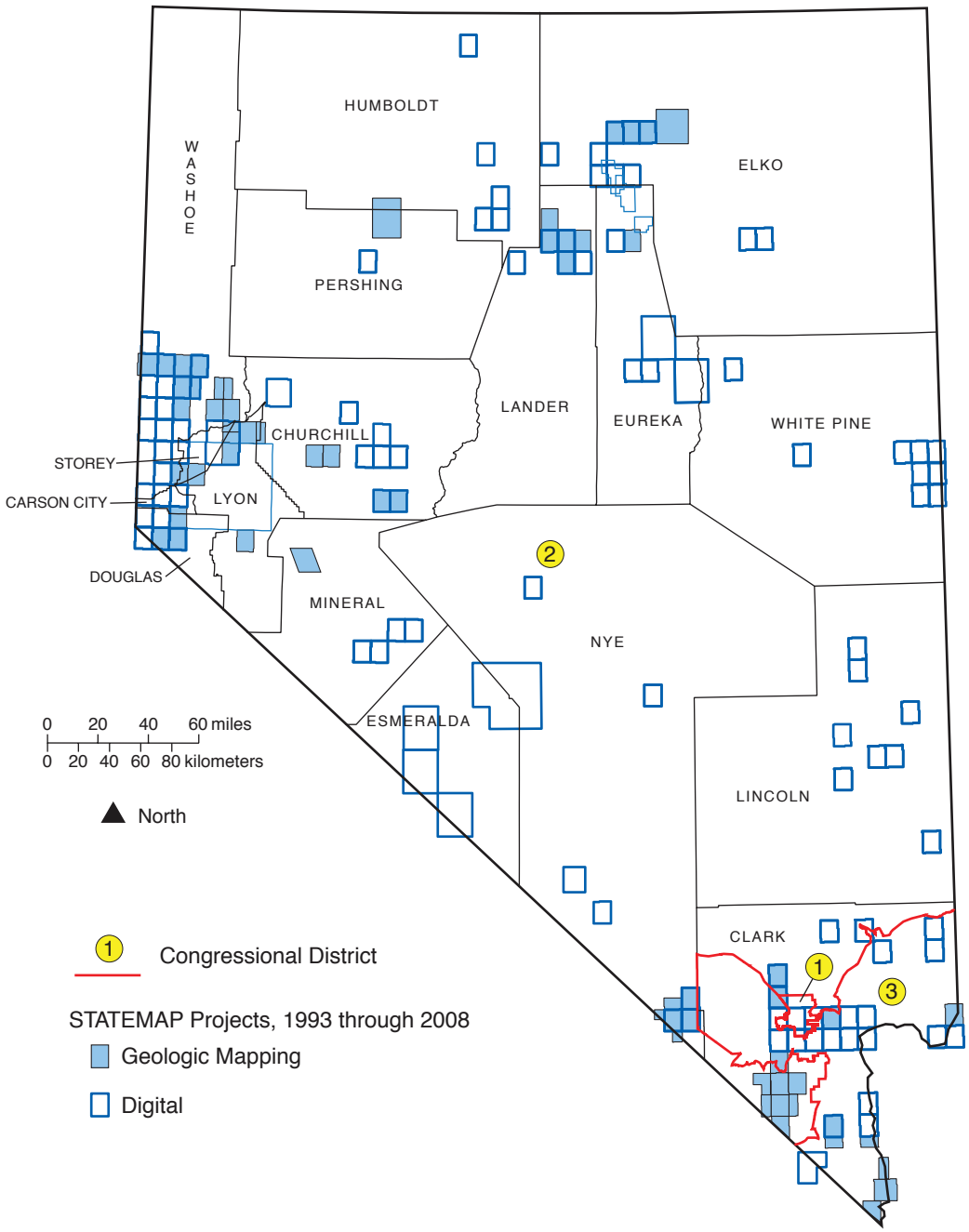
Thank you.

AASG Association of American State Geologists

United States Geological Survey

# National Cooperative Geologic Mapping Program

## NEVADA

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Program Coordinator: Peter T. Lyttle (703-648-6943)
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# SUMMARY OF STATEMAP GEOLOGIC MAPPING PROGRAM IN NEVADA

## Las Vegas Area

*New geologic maps at 1:24,000 scale*

**1994 - 1 Map**
Bird Spring (2004)

**1996 - 1 Map**
NV part of Desert (2003)
E ½ Goodsprings (2002)

**1997 - 2 Maps**
Ivanpah Valley part of Goodsprings (2004)
W ½ Hidden Valley (2003)

**1998 - 2 Maps**
Hidden Valley (2004)

**1999 - 1 Map**
W ½ McCullough Pass (2003)

**2000 - 2 Maps**
NV and AZ parts of Mount Manchester (2003)
Roach (2003)

**2001 - 3 Maps**
N ½ Searchlight (2005)
N ½ Spirit Mtn. NW (2007)
W ½ Spirit Mtn. SE (2004)

**2002 - 6 Maps**

*Digital versions of previously published geologic maps at 1:24,000 scale*

**2000 - 7 Maps**
Arrow Canyon NW (2007)
Callville Bay (2006)
Castle Mountains (2006)
Fire Mountain (2008)

**2001 - 5 Maps**
Government Wash (2006)
Hiller Mountains (2006)
Horse Springs (2008)
Meadview North (2007)

**2002 - 2 Maps**
Moapa West (2008)
Pahrump (2008)
Riverside (2008)
Nelson SW (2006)
Sixmile Spring (2008)
Weiser Ridge (2007)
Whitney Pocket (2008)

## Reno Area

*New geologic maps at 1:24,000 scale*

**1993 - 2 Maps**
Fernley East (2004)
N ½ Fernley West (2005)
Fernley West (2007)
W ½ Flowery Peak (2004)

**1996 - 1 Map**

**1997 - 1 Map**
Flowery Peak (2005)
Grimes Point (2008)
W ½ Hazen (2008)
Lahontan Mountains (2006)

**1998 - 1 Maps**

**1999 - 2 Maps**
S ½ Lower Walker River (2008)
W ½ Nixon (2002)
E ½ Pah Rah Mountain (2003)
S ½ Seven Lakes Mountain (2004)

**2000 - 4 Maps**

**2001 - 4 Maps**
Seven Lakes Mountain (2005)
Stockton Flat Well (2006)

**2002 - 1 Map**

*Digital versions of previously published geologic maps at 1:24,000 scale (** maps at 1:48,000 scale)*

**2000 - 5 Maps**
Bedell Flat (2007)
Carson City (2007)
Desert Peak/Brady Area (2008)
Dogskin Mountain (2007)
Fraser Flat and W ½ Moses Rock (2006)

**2001 - 8 Maps**
Gardnerville (2008)
Genoa (2007)
Glenbrook (2007)
Granite Peak (2008)
Marlette Lake (2007)
Minden (2008)
Mount Rose NE (2007)
New Empire (2007)
Olinghouse (2008)
South Lake Tahoe (2007)
State Line Peak (2007)
Steamboat (2007)
Sutcliffe (2008)
Parts of Wadsworth and Churchill Butte (2007)**
Washoe City (2007)

## Rural Nevada Area

*New geologic maps at 1:24,000 scale*

**1995 - 2 Maps**
N ½ Jerritt Canyon Mining District (2006)

**1996 - 1 Map**

**1997 - 3 Maps**

**1998 - 2 Maps**

**1999 - 2 Maps**
Jerritt Canyon Mining District (2007)

**2002 - 1 Map**

*Digital versions of previously published geologic maps at 1:24,000 scale (* maps at 1:62,500 scale, ** maps at 1:48,000 scale)*

**2001 - 18 Maps**
Antler Peak (2007)
Bateman Spring (2008)
Beaver Peak (2006)
Bell Canyon (2007)
Bell Mountain (2007)
Bettles Well (2007)
Big Bald Mountain (2006)
Bobs Flat (2007)
Brooks Spring (2007)
Buckskin Mountain (2007)
Camp Douglas (2007)
Chief Mountain (2007)

**2002 - 9 Maps**
Cooper Peak (2008)
Crater Flat (2007)
Deadman Spring SE (2008)
Diamond Springs (2007)*
Frazier Creek (2006)
Goldrun Creek (2007)
Indian Cove (2007)
Iron Point (2007)
Jake Creek Mountain (2007)
LaPlata Canyon (2008)
Little Horse Canyon (2006)
Magruder Mountain (2008)*
Mina (2007)
Mineral Hill (2007)**
Moho Mountain (2007)
Mormon Jack Pass (2006)
Mule Canyon (2006)
Old Mans Canyon (2006)
Pahroc Spring SE (2008)
Pintail Bay (2008)
Piper Peak (2007)*
Pirouette Mountain (2008)
Reveille (2006)
Rhyolite Ridge (2007)*
Robinson Summit (2007)
Rose Valley (2008)
Round Mountain (2007)
Rye Patch Reservoir S. (2007)
Santa Renia Fields (2008)
Third Butte East (2006)
Tonopah area (2007)**
Verdi Peak (2006)
Willow Creek Reservoir (2006)
Willow Creek Reservoir SE (2006)
Wonder Mountain (2006)

*Digital versions of Carlin Trend maps*

B111, 2 maps (2003), 1:24,0000 scale

OFR03-1, 7 maps, 1:6,000 scale

The STATEMAP part of the National Cooperative Geologic Mapping Program has helped Nevadans by significantly increasing the geographic coverage of detailed maps produced by the Nevada Bureau of Mines and Geology. Geologic mapping in the Las Vegas and Reno urban areas is focused primarily on issues related to growth and land management, including earthquake and flood hazards, land subsidence due to ground-water withdrawal, collapsing and expanding soils, landslides, ground-water protection, air quality, and raw materials for construction. Mapping of the Humboldt River basin provides key information on the origin of its precious metal deposits, which make Nevada the leading gold and silver producer in the U.S., and on the environmental and economic impacts of mining and climatic change. Planners, scientists, engineers, managers, policy makers, teachers, students, and members of the general public who are interested in the world around them use geologic maps. Only about 20% of Nevada's 1,980 7.5-minute quadrangles are adequately mapped with the detail that is needed for most applications.

## STATEMAP FUNDING

| Federal Fiscal Year | State Dollars | Federal Dollars | Total Project Dollars |
|---|---|---|---|
| 1993 | 20,519 | 20,000 | 40,519 |
| 1994 | 21,746 | 20,000 | 41,746 |
| 1995 | 15,113 | 10,000 | 25,113 |
| 1996 | 126,444 | 123,780 | 250,224 |
| 1997 | 261,357 | 152,410 | 413,767 |
| 1998 | 258,917 | 139,424 | 398,341 |
| 1999 | 175,175 | 115,500 | 290,675 |
| 2000 | 135,520 | 111,210 | 246,730 |
| 2001 | 216,702 | 196,289 | 412,991 |
| 2002 | 220,825 | 213,597 | 434,422 |
| 2003 | 184,860 | 183,231 | 368,091 |
| 2004 | 203,225 | 171,583 | 374,808 |
| 2005 | 172,489 | 135,032 | 307,521 |
| 2006 | 234,966 | 205,172 | 440,138 |
| 2007 | 215,122 | 214,559 | 429,681 |
| 2008 | 267,245 | 193,616 | 460,861 |
| | $2,730,225 | $2,205,403 | $4,935,628 |

*November 2008*

Mackay School of Earth Sciences and Engineering
College of Science
University of Nevada, Reno

# Nevada Bureau of Mines and Geology

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Joseph V. Tingley, *Economic Geologist* - metals & mining history
Susan L. Tingley, *Publications Manager & Chief Cartographer* - cartography & geography

## Adjunct Faculty

Donald C. Helm, *Adjunct Research Scientist* - subsidence and groundwater modeling
(Morgan State University, Baltimore, Maryland)

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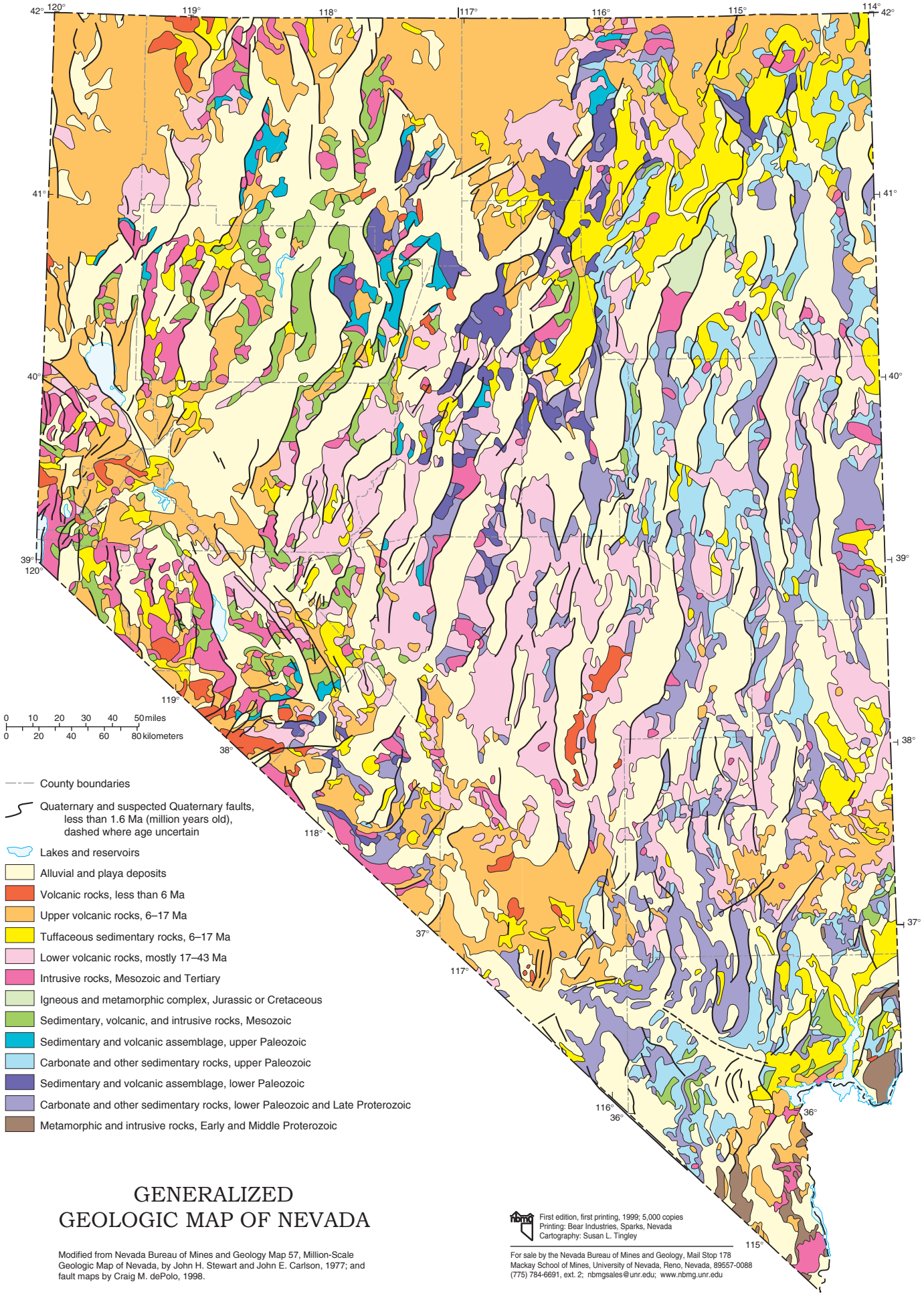


# GENERALIZED GEOLOGIC MAP OF NEVADA

Modified from Nevada Bureau of Mines and Geology Map 57, Million-Scale Geologic Map of Nevada, by John H. Stewart and John E. Carlson, 1977; and fault maps by Craig M. dePolo, 1998.

First edition, first printing, 1999; 5,000 copies
Printing: Bear Industries, Sparks, Nevada
Cartography: Susan L. Tingley

For sale by the Nevada Bureau of Mines and Geology, Mail Stop 178
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