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in:
Geology of the Albuquerque Region - Fall Field Conference 2026, Connell, Sean D.; Koning, Daniel J.;, New Mexico Geological Society 76th Annual Fall Field Conference Guidebook, 452 p. https://doi.org/10.56577/FFC-76

This is a section from the 2026 NMGS Fall Field Conference Guidebook.

Annual NMGS Fall Field Conference Guidebooks

Every fall since 1950, the New Mexico Geological Society (NMGS) has held an annual Fall Field Conference that explores some region of New Mexico (or surrounding states). Always well attended, these conferences provide a guidebook to participants. Besides detailed road logs, the guidebooks contain many well written, edited, and peer-reviewed geoscience papers. These books have set the national standard for geologic guidebooks and are an essential geologic reference for anyone working in or around New Mexico.

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NMGS has decided to make peer-reviewed papers from our Fall Field Conference guidebooks available for free download. This is in keeping with our mission of promoting interest, research, and cooperation regarding geology in New Mexico. However, guidebook sales represent a significant proportion of our operating budget. Therefore, only *research papers* are available for download. *Road logs*, *mini-papers*, and other selected content are available only in print for recent guidebooks.

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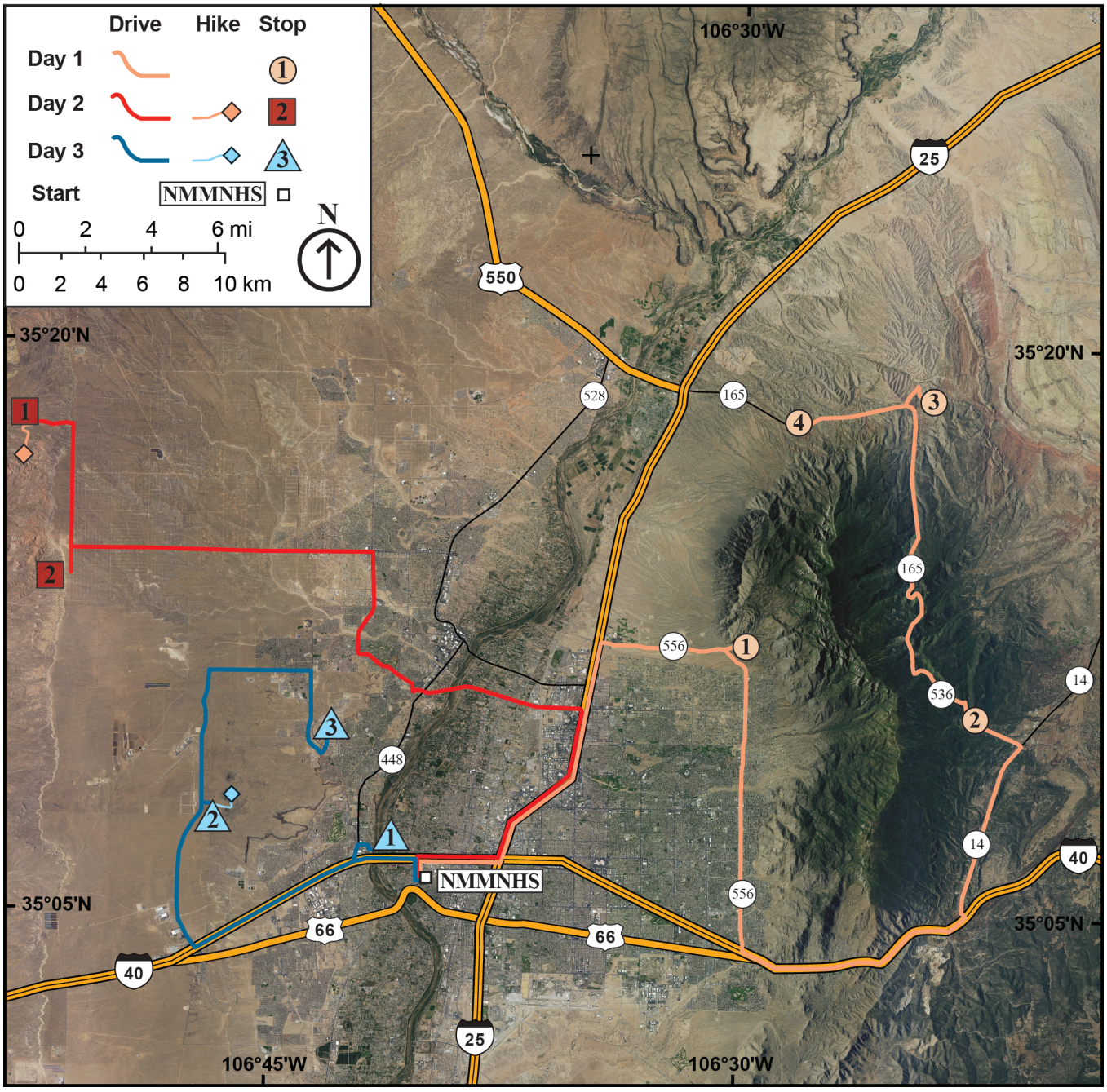
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GEOLOGY OF THE ALBUQUERQUE REGION

New Mexico Geological Society
2026



Map of field-trip routes and stops for the 76th New Mexico Geological Society Fall Field Conference to the Albuquerque Region.
All road logs begin from the parking lot of the New Mexico Museum of Natural History and Science (NMMNHS) Annex.
Written permission from the Pueblo of Santa Ana is required to visit Stop 1 on Day 2.
Image source: ESRI, Vantor, Earthstar Geographics, IGN, and the GIS User Community.

Geology of the Albuquerque Region

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New Mexico Geological Society
76th Fall Field Conference
October 21–24, 2026

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The New Mexico Geological Society is a tax-exempt corporation registered in the State of New Mexico that promotes interest in geology and associated sciences, fosters scientific research and publications, encourages cooperation among its members, and stimulates interest in New Mexico geology. These goals are met through annual fall field conferences held in different locations in New Mexico or adjoining states and annual spring meetings, generally held in Socorro, New Mexico, where oral and poster presentations on different aspects of New Mexico geology are given.

New Mexico Geological Society
c/o: New Mexico Bureau of Geology and Mineral Resources
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Socorro, NM 87801-4796
https://nmgs.nmt.edu

Front Cover: Sean D. Connell and Celestyn Brożek
Inside Front Cover: Daniel J. Koning and Sean D. Connell
Title Page: Sean D. Connell
Sponsor Page Layout: Sean D. Connell and Christopher Wolf
Stratigraphic Sections (including inside back cover): Sean D. Connell, Daniel J. Koning, and Spencer G. Lucas
Generalized Geologic Map and Cross Sections: Sean D. Connell
Back Cover: Sean D. Connell
Photography and Figures: Filler photographs provided by Celestyn Brożek, Stan Davis, and the guidebook editors. Road-log and filler figures prepared by the road-log authors. Article photographs and figure preparation by the respective authors.
Logistical Assistance: New Mexico Bureau of Geology and Mineral Resources and New Mexico Museum of Natural History and Science
Copy Editors: Rebecca Barr, Allyson Mathis, and Carrin Rich
Formatting and Production: Brittney Van Der Werff
Printing: Starline Printing, Albuquerque, New Mexico

ISBN: 1-58546-122-9
EAN: 978-1-58546-122-6
https://doi.org/10.56577/FFC-76

76th ANNUAL FALL FIELD CONFERENCE GUIDEBOOK
FIRST EDITION 2026
PRINTED IN THE U.S.A.

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CONFERENCE ORGANIZER'S MESSAGE

The Albuquerque–Rio Rancho metropolitan area is home to nearly one million people and contains notable geologic landmarks in New Mexico, such as the Sandia Mountains and Albuquerque Volcanoes. Water issues and geologic hazards are linked to the region's unique geology, making it an enduring subject of scientific interest. Geologic investigations span more than a century, ranging from early reconnaissance mapping to modern multidisciplinary studies of tectonics, stratigraphy, geomorphology, and hydrology. This conference highlights the diverse geology of the region, including Proterozoic and Phanerozoic rocks and structures, Quaternary faulting and volcanism, landslides, and groundwater. This guidebook synthesizes results from more than 850 sources, reflecting continued advances in understanding the region's geology.

The New Mexico Geological Society (NMGS) Fall Field Conference series has long provided a forum for examining the geology the Albuquerque region. The 3rd Field Conference, held in 1952, visited Albuquerque as part of a north-to-south transect of the Rio Grande Country. The 12th Field Conference in 1961 established a foundational framework for understanding the Albuquerque Country by emphasizing the integration of stratigraphy, structure, and geomorphology through field-based observation. The 33rd Field Conference in 1982 expanded this perspective by incorporating basin-scale interpretations of stratigraphy and geomorphology, highlighting the Rio Grande rift as a central organizing feature of the landscape. By the 50th Field Conference in 1999, advances in geophysics, geochronology, and tectonic analysis enabled a more comprehensive understanding of the region's tectonic history, stratigraphy, and hydrogeology. The 76th Field Conference builds on these earlier efforts, reflecting on how advances in data collection and analytical approaches continue to be developed, adopted, and applied in New Mexico.

Building on studies and themes presented in previous field conferences, this guidebook highlights recent efforts to integrate geochronologic, geophysical, and hydrogeologic datasets to provide a more holistic view of the geology of central New Mexico. This guidebook contains original research and syntheses spanning numerous subdisciplines, including structure and tectonics, thermochronology, igneous petrology and volcanology, stratigraphy and geomorphology, geologic hazards, hydrogeology, and critical minerals. As with previous conferences, road logs and papers provide a broad view of the current understanding and conceptual frameworks and prevailing paradigms, serving as a foundation for future investigations. The Albuquerque region remains one of the most intensively studied areas in New Mexico, where new data continue to refine and, in some cases, challenge longstanding interpretations. By revisiting classic and new localities and integrating field-based and subsurface observations, this conference highlights the enduring value of field-based geologic inquiry.

We thank the 43 authors from 19 institutions who contributed to this guidebook, as well as the many reviewers for their thoughtful comments. We thank Associate Editors Johanna Blake, Kent Condie, Jerry Kendall, Spencer Lucas, Grant Meyer, Laila Sturgis, Geoff Rawling, and Matt Zimmerer for facilitating the peer reviews of the articles in this guidebook. Their dedication, professionalism, and careful oversight of the review process greatly improved the quality, accuracy, and scientific rigor of this volume. We are grateful to the field-trip leaders and road-log authors, whose efforts continue the NMGS tradition of excellence in field-based geologic research, education, and outreach. We thank the Pueblo of Sandia, Pueblo of Santa Ana, Sandia Ranger District, Bureau of Land Management, New Mexico State Land Office, Albuquerque Open Space, and Max Dawkins, as well as other local, state, and federal agencies, for helping to promote geoscience education in New Mexico. Finally, we extend our sincere appreciation to the many NMGS organizers and volunteers whose dedication and hard work made this conference possible. In particular, we thank Susan Lucas Kamat for organizing the food and social events, Nels Iverson for coordinating vehicle logistics, Connie Apache for managing conference registration, and Amanda Doherty, Hannah Hunt, and Siânin Spaur for designing the conference T-shirts.

Sean D. Connell and Daniel J. Koning, New Mexico Bureau of Geology and Mineral Resources

PRESIDENT'S MESSAGE

It is a joy to welcome you to the 76th NMGS Fall Field Conference (FFC), the fourth in the Albuquerque area. I use the word "joy" because I think it describes what so many of us feel when participating in NMGS activities and what keeps us coming back over the decades.

I have been a member of NMGS for more than two decades, and I consider my initiation into NMGS to be rather late in my career, after graduating from New Mexico Tech with my master's degree. I say late, because I wish I had taken advantage of everything NMGS when I was a student. Nevertheless, my first taste was the 2003 Geology of the Zuni Plateau Fall Field Conference. There, I was introduced to the fantastic geology of northwest New Mexico, met some of the giants of New Mexico geology, and experienced the incredible culture of the Navajo Nation. Since then, I've attended every field conference but three, and I've led two field conferences, organized or contributed to several spring meetings, and served on the NMGS Executive Committee for four years. I don't exaggerate too much to say NMGS is in my blood.

That said, I have never attended a Fall Field Conference in Albuquerque, and, having previously lived in the North Valley, I look forward to learning more about the area's geology. Kudos to the leaders Sean Connell and Dan Koning, with logistical support from Susan Lucas Kamat and Nels Iverson. Their plans for this conference grew out of a recent series of Fall Field Conferences that explored the transitions among the Colorado Plateau, the Rio Grande rift, and the southern Rocky Mountains. This series started with the Nacimiento FFC in 2024, the Cuba FFC in 2025, and now Albuquerque in 2026.

Sean and Dan have done a great job of pulling together the guidebook, which included finding two reviewers for each paper, providing science editing of each paper, and leading the effort of the road logs—no small task. Thanks go out to David Lemke, who, as chair of the NMGS Publications Committee, assembled an editing team to assist that included Brittney Van Der Werff as layout editor and Allyson Mathis, Carrin Rich, and Rebecca Barr as copy editors.

These leaders have given considerable energy to the Society through field conferences, spring meetings, and NMGS leadership and have contributed tremendously to our understanding of the geology of this great state. Their example speaks to the success of our society, a success that is possible because of many other people as well.

The last year has seen tremendous changes to the support structure of NMGS, fueled in part by a cybersecurity attack that prompted a re-examination of the decades-old hosting of the NMGS website by the New Mexico Bureau of Geology and Mineral Resources. A new website team was formed to augment our one-man web team, Michael Zbrożek. The result will be a new NMGS website in 2027. Another result was the re-evaluation of our antiquated membership and registration tracking system. We anticipate replacing that system by spring 2027, and we are looking for people to join our team planning those changes!

This year marks a new change to the guidebook—the sponsorship page—the result of the NMGS Development Committee, tasked with raising funds to support our conferences. That team, led by Chris Wolf, secured sponsorships for our 2026 spring meeting for the first time in many decades, providing financial support to offset the fast-growing basic costs of the spring meeting and the fall field conference. Sean Connell assisted the committee in securing additional sponsors for the guidebook. These sponsors are acknowledged in the front section of this guidebook.

The people and groups I list here are just a small handful of the many who make NMGS the amazing organization that it is. As one of the most active state geological societies in the country, NMGS thrives on the dedication and generosity of its members, including you, dear reader, whose support has sustained our society for decades and will ensure continued success for many years to come. Thank you for joining us. We hope to see you at the 2027 El Paso–Juarez Borderland and 2028 Las Cruces Fall Field Conferences!

Bonnie Frey, 2026 NMGS President

NEW MEXICO GEOLOGICAL SOCIETY FOUNDATION

The New Mexico Geological Society (NMGS) Foundation was established in 2003 with the mission to provide final support for educational and scientific objectives that benefit the geologic profession in New Mexico and the general public. NMGS has a distinguished history as one of the premier state geologic organizations in the country, dating to its founding in 1947. One of the primary attributes that differentiates NMGS from other state geological societies is its ready access to world-class outcrops and its efforts to get young geoscience students out of the classroom and into this natural laboratory to gain hands-on experience during the annual Fall Field Conferences. NMGS Fall Field Conference organizers and presenters are at the forefront of their respective geoscience fields and use the latest technologies and applications to optimize student learning experiences and broaden their educational experience.

The NMGS Foundation was created as a nonprofit organization—a 501(c)(3) Corporation—whose revenues are responsible for supporting activities that include the annual Fall Field Conference, Spring Meeting, numerous Grants-in-Aid to students undertaking earth-science research in the state of New Mexico, and scholarships to students attending 4-year colleges and research universities throughout New Mexico.

Ensuring student participation in NMGS field conferences and research events will continue the society's legacy as a leading nationwide destination for geoscience education. In that spirit, we invite you to join us in supporting the NMGS with a philanthropic gift. Please visit our website (https://nmgs.nmt.edu/donations) to make your charitable gift or contribution. With the strength of current and future members, the NMGS will continue to reign as the premier state geological society in the nation.

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DEDICATION



STEPHEN G. WELLS

The New Mexico Geological Society is pleased to co-dedicate its 76th Annual Fall Field Conference to Dr. Stephen G. Wells in recognition of his outstanding contributions to Quaternary geology, geomorphology, higher education, and scientific leadership. For more than four decades, Stephen has advanced understanding of landscape evolution in arid and semiarid regions while serving as an influential mentor, administrator, and advocate for Earth Science. It is a special honor to write this dedication, having first met Stephen in 1977 at the 8th Binghamton Geomorphology Symposium on Geomorphology in Arid Regions.

Dr. Wells made pioneering contributions to understanding eolian systems and desert landscape evolution. His research improved understanding of desert pavement formation, volcanic landscape development, hillslope processes, and debris-flow generation, providing important insights into geomorphic responses to environmental change in dryland settings. His studies of the Chaco dune field and other arid-land environments showed that soils preserve valuable records of environmental change and offered new perspectives on landscape evolution. His influential work on arroyo development in western New Mexico showed that channel incision reflects complex interactions among climatic variability, vegetation change, sediment supply, and land use rather than overgrazing alone.

Stephen's early work in the Harquahala Mountains of Arizona established him as a rising leader in Quaternary geomorphology. He joined the Department of Geology at the University of New Mexico (UNM) in 1976, where he helped build one of the nation's leading Quaternary studies programs. At UNM, he mentored numerous students who went on to successful careers in academia, government, and industry. Stephen later served as department chair and earned recognition as a UNM Presidential Lecturer.

In 1991, Dr. Wells moved to the University of California at Riverside, and later to the Desert Research Institute (DRI) in Nevada, where he ultimately became president. At DRI, he expanded research programs, strengthened partnerships, and promoted the role of interdisciplinary Earth Science in addressing society and environmental challenges. In 2016, he became the 17th President of the New Mexico Institute of Mining and Technology. His return to New Mexico was warmly welcomed by colleagues and friends across the state. During his presidency, he strengthened academic programs and fostered a more cohesive scholarly community by bringing together faculty, researchers, and staff around shared academic, research, and service goals. He expanded institutional partnerships, collaborations, and fundraising efforts, enhanced alumni engagement, and reinforced New Mexico Tech's longstanding reputation for excellence in science, engineering, and research.

Dr. Wells' professional accomplishments have been recognized widely. He is a Fellow of the Geological Society of America and recipient of the Kirk Bryan Award, Farouk El-Baz Award for Desert Research, and Gladys Cole Memorial Research Award. He served GSA in numerous leadership roles, including President, Council member, and chair of the Quaternary Geology and Geomorphology Division. Throughout his career, he maintained strong ties to NMGS, organizing the 33rd Fall Field Conference, editing the 1982 *Albuquerque Country II* guidebook, and helping organize the 2026 Spring Meeting theme, *Lessons from New Mexico's Landscapes*. Since stepping down as President of New Mexico Tech in 2023, Stephen has continued to support geoscience education and research through his service as a Trustee of the GSA Foundation.

Les McFadden, Professor Emeritus, University of New Mexico

DEDICATION



JOHN W. SHOMAKER

For his many contributions to hydrogeology, groundwater management, and applied geology in New Mexico, as well as his long career in geologic consulting, it is a pleasure to co-dedicate this guidebook to John W. Shomaker. For more than six decades, John has played a central role in advancing the understanding, development, and stewardship of New Mexico's groundwater resources while serving as a mentor, educator, consultant, and leader within the New Mexico geoscience community.

Born in Pueblo, Colorado, in 1942 and raised in Colorado and Florida, John earned his B.S. and M.S. degrees in geology from the University of New Mexico (UNM) during the 1960s, where he studied under Vincent C. Kelley, founder of the New Mexico Geological Society (NMGS). Following completion of the U.S. Geological Survey (USGS) Water Resources Division Training Program in Hydrology in 1966, John worked as a USGS hydrologist from 1965 to 1969, before joining the (then) New Mexico Bureau of Mines and Mineral Resources from 1969 to 1973. John left the Bureau to start what would become John Shomaker & Associates, Inc., an Albuquerque-based water-resource and environmental consulting firm that served the broader Southwest since 1973. While maintaining an active consulting practice, John pursued advanced degrees in hydrogeology, eventually completing a Ph.D. in hydrogeology from the University of Birmingham in 1995.

John's early investigations focused on San Juan Basin coal resources, often in collaboration with Edward Beaumont, who provided him with his first office space. However, hydrogeology ultimately became his professional focus. His many contributions include investigations of the hydrogeology of the Fort Wingate–Gallup region, county-level reconnaissance studies of New Mexico's groundwater resources, evaluation of the Albuquerque Basin aquifer system, and development of municipal and regional water supplies, including the Buckman well field in Santa Fe. He played an important role in efforts to manage Pecos River flows through groundwater augmentation, demonstrating both technical expertise and a sophisticated understanding of interstate compact obligations. Over the course of his career, John authored hundreds of hydrogeologic studies, provided expert testimony in numerous water-rights cases, and contributed to the design and completion of more than 200 water-supply wells that helped quench the thirst of many New Mexicans (including 14 City of Albuquerque supply wells). Some of John's earliest employees remained with him for nearly 40 years, reflecting the loyalty inspired by his mentorship, ethics, and leadership.

John has been actively involved with NMGS for over 60 years, serving as Secretary of the Executive Committee, Guidebook Editor, and President. John has also been a long-time supporter and officer of the NMGS Foundation. As an Adjunct Associate Professor of Geology at UNM, he mentored generations of students and helped establish their Water Resources Program.

Throughout his career, John combined scientific rigor with practical problem-solving, bringing thoughtful judgment and deep technical expertise to complex hydrogeologic challenges. Colleagues know him as a humble and engaging speaker whose storytelling is often accompanied by subtle humor that rewards the careful listener. Widely respected as an accomplished hydrogeologist, dedicated mentor, and trusted colleague, John embodies the highest ideals of the profession: intellectual curiosity, scientific rigor, integrity, practicality, and committed to public service. In recognition of his lasting contributions to New Mexico geoscience and water resources, we are honored to co-dedicate this guidebook to John.

Roger L. Peery, Erwin A. Melis, Annie M. McCoy, and Steven T. Finch, Jr.

MEMORIAL



BRUCE A. BLACK (1936–2025)

Dr. Bruce A. Black (1936–2025), one of the foundational experts on the geology of the Albuquerque Basin and a longtime member of the New Mexico Geological Society (NMGS), passed away on July 8, 2025. Through a career spanning petroleum geology, military service, and scientific leadership, Bruce made enduring contributions to understanding the Rio Grande rift and New Mexico geology.

Bruce was born in Albuquerque, New Mexico, on August 20, 1936, to Ruth and Harmon Black. Following graduation from Highland High School in 1954, he enlisted in the U.S. Navy Reserve. Bruce attended the University of New Mexico (UNM) before transferring to Texas Western College (now the University of Texas at El Paso) on a football scholarship, earning a B.S. in geology in 1959. That same year, he was commissioned as an ensign in the U.S. Navy and married Marjorie Watkins, beginning a partnership that would span more than six decades. Following four years of active naval duty, Bruce returned to UNM, completing an M.S. in geology in 1964.

Bruce began his professional geology career with Shell Oil Company in California, where he advanced to senior staff geologist and served as assistant to the Vice President of Shell's Pacific Coast Region. During this time, he pursued doctoral studies part-time. In 1970, he returned to New Mexico and co-founded Colorado Plateau Geological Services and the Colorado Plateau Well Logging Company. He completed his PhD in geology at UNM in 1974 and later reorganized his business ventures into Black Oil, Inc., ultimately founding Black Exploration LLC in 2009.

Bruce's scientific legacy is particularly significant in the Albuquerque Basin and Rio Grande rift, where his work helped establish a framework for understanding basin structure, tectonic evolution, and petroleum potential. His NMGS papers remain foundational references for the Albuquerque Basin, providing comprehensive analyses of the region, elegantly portrayed in block diagrams that depict the tectonic and structural evolution of the Albuquerque Basin and Four Corners region. His investigations of the Santa Fe–Galisteo–Hagan region and on the Otero Platform demonstrated the breadth of his geologic insight. Bruce left a practical legacy in petroleum exploration. He drilled the Black Oil No. 1 well in the southern Española Basin, the only productive oil well to date in the Rio Grande rift. Later in his career, he pursued helium exploration in the northern rift.

Bruce also led a distinguished parallel career in military service. Returning to the Naval Reserve after active duty, he rose to the rank of Rear Admiral (two-star) in 1991 and served as Commander of Naval Reserve Intelligence from 1992 until retirement in 1996. He was also an accomplished pilot (and built a 7/8-scale replica of a British Mark IX Spitfire), a past president of the Rocky Mountain Section of the American Association of Petroleum Geologists (AAPG), and a board member of the New Mexico Museum of Natural History.

Bruce is survived by his wife, Marjorie; son Bruce H. Black; daughter Leigh Irvin (Joel); and grandchildren Ashleigh, Marilei, Alice, Tasha, and Ruth Iris. His scientific contributions, leadership, and generosity of spirit leave an enduring legacy in New Mexico geology.

Ron Broadhead and Sean D. Connell, New Mexico Bureau of Geology and Mineral Resources

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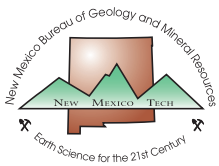
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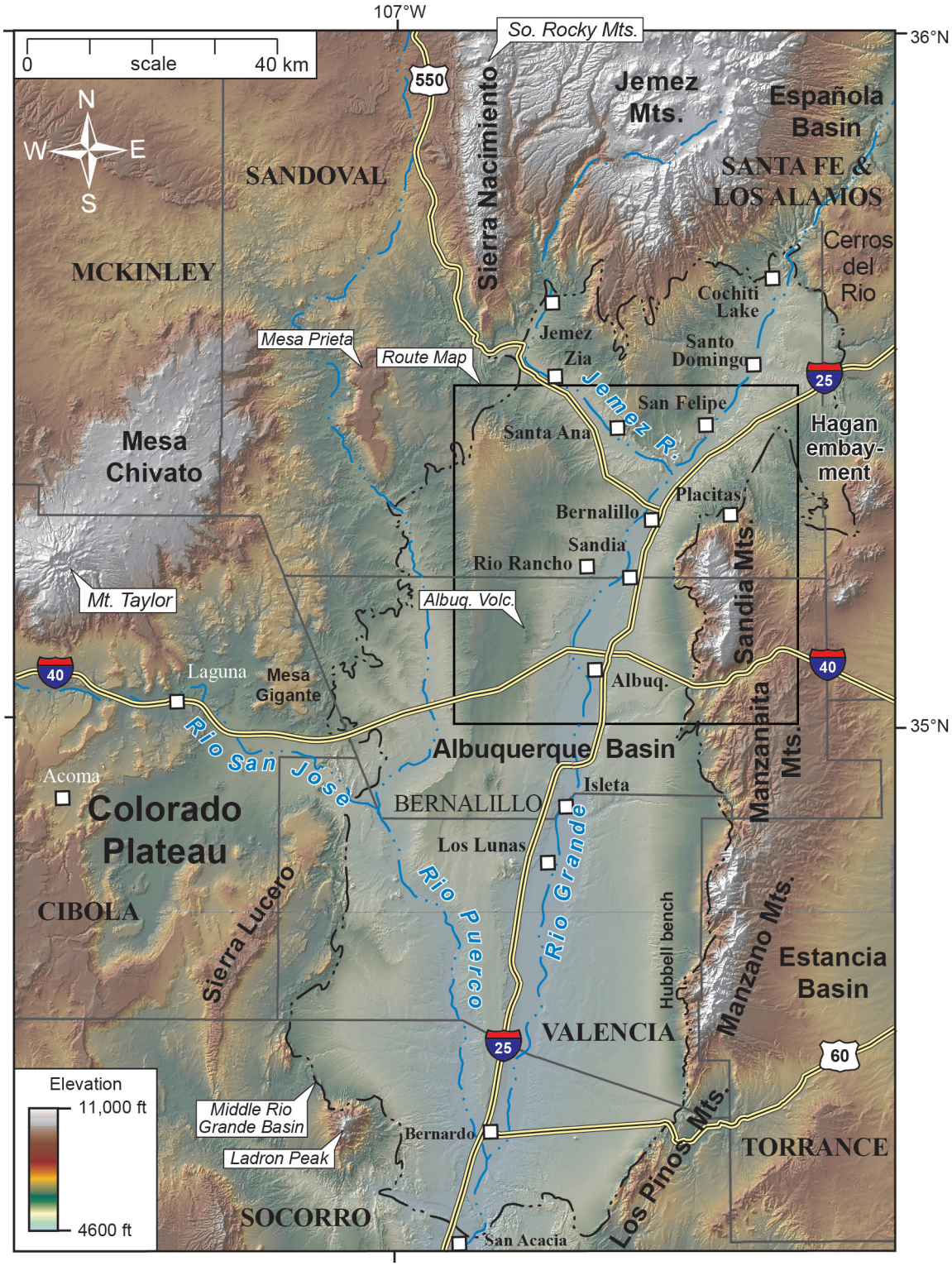












Shaded-relief map of the Albuquerque Basin, illustrating major physiographic features. The area of the Fall Field Conference Route Map is shown by the black square.