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EDUCATION

B.S., Geological Sciences, New Mexico State University, 1979
Ph.D., Geophysics, Southern Methodist University, 1984

PROFESSIONAL AND FIELD EXPERIENCE

July, 2010 – present: Senior geophysicist and field geologist, Chair of the Publication Committee, New Mexico Bureau of Geology and Mineral Resources.
January, 2005 – June, 2010: Web information specialist and field geologist, New Mexico Bureau of Geology and Mineral Resources.
May, 2001 – January, 2005: STATEMAP contract mapper, Jemez Mountains.
January, 1995 - present: Adjunct Faculty, Department of Earth and Environmental Sciences, New Mexico Institute of Mining and Technology, Socorro, NM, 87801.
September, 1984 – January, 2005: Consulting geoscientist; fission-track analysis for ARCO, Amoco, Mobil, Cornell University, and University of Wyoming, geothermal resource evaluation, seismic data interpretation.
January, 1987 - December, 1994: Adjunct Assistant Professor of Geological Sciences, SMU.
September, 1985 - May, 1986; September, 1988 - December, 1994: Part-time instructor, physical and historical geology, Richland Community College.
September, 1979 - May, 1984: Research assistant, fission-track dating, computer modeling (FORTRAN) of temperatures associated with uplift and erosion, sedimentary basin formation, and geothermal systems, D.D. Blackwell and I.J. Duncan, Dept. of Geological Sciences, SMU.
May, 1979 - August, 1979: Field geologist, New Mexico Bureau of Mines and Mineral Resources, W.R. Seager (NMSU) and John Hawley (NMBMMR).
January, 1978 - May, 1979: Teaching assistant, undergraduate geology labs, Earth Sciences Department, NMSU.
January, 1977 - December, 1978: Research and field assistant, geothermal resource assessment, C.A. Swanberg, Physics Department, NMSU.

PROFESSIONAL AND OTHER ORGANIZATIONS

Geothermal Resources Council, Secretary-Treasurer, DFW Section, 1984-85
President, Los Alamos Geological Society, 1998-2000.
New Mexico Geological Society, Executive Committee, 2006-2009.
President, New Mexico Geological Society, 2008.
Chair, Rocky Mountain Section, Geological Society of America, 2010-2012.
National Renewable Energy Laboratory Energy Executive Leadership Program Alumni, 2015

GRANTS AND AWARDS

Sigma Gamma Epsilon Tarr Award, 1979
Roy M. Huffington Fellowship, 1982-1983
New Mexico Geological Society Honorary Membership, 2010
New Mexico State University Geological Sciences Alumni Hall of Fame, 2011
Geological Society of America Fellow, 2013

PUBLICATIONS

Papers and Geologic Maps

2021

- Kelley, S.A., 2021, Geologic map of the Organ Peak NW 7.5-minute quadrangle, Doña Ana County, New Mexico: Open-file Geologic Map 289: 1:24,000 scale.
- Kelley, S., Barkmann, P., Benson, R., Lovekin, J., and Dunn, L., 2021, Geologic road log: Cumbres & Toltec Scenic Railroad, New Mexico Bureau of Geology and Mineral Resources, 33 p.
- Thacker, J. O., Kelley, S. A., and Karlstrom, K. E., 2021, Late Cretaceous–Recent low-temperature cooling history and tectonic analysis of the Zuni Mountains, west-central New Mexico: *Tectonics*, v. 40, e2020TC006643. <https://doi.org/10.1029/2020TC006643>.
- Gavel, M.M., Amato, J.M., Ricketts, J.W., Kelley, S., Biddle, J.M., and Delfin, R.A., 2021, Thermochronological transect across the Basin and Range/ Rio Grande rift transition: Contrasting cooling histories in contiguous extensional provinces: *Geosphere*, v. 17, no. 6, p. 1807– 1839, <https://doi.org/10.1130/GES02381.1>.
- Pepin, J.D., Robertson, A.J., and Kelley, S.A., 2022, Salinity contributions from geothermal waters to the Rio Grande and shallow aquifer system in the transboundary Mesilla (United States)/Conejos-Médanos (Mexico) Basin: *Water*, v. 14, 33, 24 p., <https://doi.org/10.3390/w14010033>.
- McLemore, V. T., Kelley, S., Zimmerer, M. J., Owen, E., Haft, E. B., Cantrell, T., Gysi, A., Dietz, H.; Cherotich, S., Trivitt, A., 2021, Geology and mineral deposits of the Gallinas Mountains, Lincoln and Torrance Counties, New Mexico: New Mexico Bureau of Geology and Mineral Resources Open-file Report 617, 164 p.

2020

- Kelley, S.A., 2020, Colorado Plateau/Mogollon Slope: The Geology of Southern New Mexico's Parks, Monuments, and Public Lands, New Mexico Bureau of Geology and Mineral Resources, p. 19-23.
- Kelley, S.A., 2020, The Basin and Range: The Geology of Southern New Mexico's Parks, Monuments, and Public Lands, New Mexico Bureau of Geology and Mineral Resources, p. 93-99.
- Kelley, S.A., 2020, Three Rivers Petroglyph Site: The Geology of Southern New Mexico's Parks, Monuments, and Public Lands, New Mexico Bureau of Geology and Mineral Resources, p. 211-214.
- Kelley, S.A., 2020, Oliver Lee Memorial Park: The Geology of Southern New Mexico's Parks, Monuments, and Public Lands, New Mexico Bureau of Geology and Mineral Resources, p. 233-236.
- Kelley, S.A., 2020, Fort Selden State Monument and Leasburg Dam State Park: The Geology of Southern New Mexico's Parks, Monuments, and Public Lands, New Mexico Bureau of Geology and Mineral Resources, p. 251-254.
- Kelley, S.A., 2020, Mesilla Valley Bosque State Park: The Geology of Southern New Mexico's Parks, Monuments, and Public Lands, New Mexico Bureau of Geology and Mineral Resources, p. 255-257.
- Kelley, S.A., and Price, L.J., 2020, A brief introduction to the geology of southern New Mexico: The Geology of Southern New Mexico's Parks, Monuments, and Public Lands, New Mexico Bureau of Geology and Mineral Resources, p. 7-15.
- Kelley, S., M. Fichera, M., Evenocheck, E., Eberle, B.A., Person, M, Cadol, D., Newton, B.T., Timmons, S., and Pokorny, C., 2020, Assessment of water resources in the Salt Basin region of New Mexico and Texas: Data summary report: New Mexico Bureau of Geology and Mineral Resources Open-file Report 608.
- Goff, F., and Kelley, S.A., 2020, Facts and hypotheses regarding the Miocene–Holocene Jemez Lineament, New Mexico, Arizona and Colorado: New Mexico Geological Society, Special Publication 14, p. 1-15.

- Newton, B.T., and Kelley, S.A., 2020, Continuous soil-moisture measurements to assess fracture flow in Inscription Rock at El Morro National Monument, New Mexico: Implications for the deterioration of inscriptions New Mexico Geological Society, Special Publication 14, P. 177-188.
- Rawling, G., and Kelley, S., 2020, Sunshine Valley hydrogeology study: New Mexico Bureau of Geology and Mineral Resources Open-file Report 607, 68 pp.
- Jochems, A. P., Kelley, S.A., and Seager, W.R., 2020, Geologic map of the Tortugas Mountain 7.5-minute quadrangle, Doña Ana County, New Mexico: New Mexico Bureau of Geology and Mineral Resources Open-file Geologic Map 282: scale 1:24,000.
- Goff, F., McIntosh, W., Peters, L., Wolff, J.A., Kelley, S.A., Goff, C.J., and Osburn, G.R., 2020, Volcanic evolution of Mount Taylor stratovolcano, New Mexico: Facts and misconceptions: New Mexico Geological Society, Special Publication 14, p. 17-28.

2019

- Goff, F., Kelley, S.A., Goff, C.J., McCraw, D.J., Osburn, G.R., Lawrence, J.R., Drakos, P.G., and Skotnicki, S.J., 2019, Geologic map of the Mount Taylor volcano area, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Geologic Map 80, 1:36,000 scale w/ 57 page booklet.
- Grapenthin, R., Kelley, S., Person, M., & Folsom, M., 2019, Decadal-scale aquifer dynamics and structural complexities at a municipal wellfield revealed by 25 years of InSAR and recent groundwater temperature observations. *Water Resources Research*, 55. <https://doi.org/10.1029/2018WR022552>
- Pepin, J.D., Robertson, A.J., and Kelley, S.A., 2019, Borehole temperature profiles measured in the Mesilla Basin, New Mexico during the period 1972 through 2018: U.S. Geological Survey data release, <https://doi.org/10.5066/P9FQ9BEN>.
- Yonkee, W. A., Eleogram, B., Wells, M.L., Stockli, D. F., Kelley, S., & Barber, D.E., 2019, Fault slip and exhumation history of the Willard thrust sheet, Sevier fold-thrust belt, Utah: Relations to wedge propagation, hinterland uplift, and foreland basin sedimentation: *Tectonics*, v. 38, p. 2850–2893. <https://doi.org/10.1029/2018TC005444>
- Kelley, S., 2019, Earth Briefs: The Las Cruces mastodon: *Lite Geology*, v. 44, p. 2.
- Kelley, S., 2019, Earth Briefs: Trackways at White Sands National Monument: *Lite Geology*, v. 45, p.2

2018

- Kelley, S., 2018, Earth Briefs: The Valles Caldera National Preserve: *Lite Geology*, v. 43, p. 1-2.
- Kelley, S.A., 2018, Earth Briefs: The detrital zircon revolution, v. 42, p. 1-2.

2017

- Kelley, S.A., and Karlstrom, K.E., 2017, Thermal and structural history of Paleozoic and Proterozoic rocks in the vicinity of Molas Pass, northern Needle Mountains, southwestern Colorado: *New Mexico Geological Society Guidebook*, v. 68, p. 97-102.
- Karlstrom, K.E., Crossey, L.J., Embid, E., Crow, R., Heizler, M., Hereford, R., Beard, L.S. Ricketts, J.W., Cather, S., and Kelley, S., 2017, Cenozoic incision history of the Little Colorado River: Its role in carving Grand Canyon and onset of rapid incision in the past ca. 2 Ma in the Colorado River System: *Geosphere*, v. 13, p. 49-81, doi:10.1130/GES01304.1
- Winn, C., Karlstrom, K.E., Shuster, D.L., Kelley, S. and Fox, M., 2017, 6 Ma age of carving Westernmost Grand Canyon: Reconciling geologic data with combined AFT, (U–Th)/He, and $^4\text{He}/^3\text{He}$ thermochronologic data: *Earth and Planetary Science Letters*, v. 474, 257-271.
- Kelley, S., 2017, Earth Briefs: Snowmaking: *Lite Geology*, Issue 41, p.1-2.

2016

- Kelley, S., Person, M., Kelley, R., and Pepin, J., 2016, Low-temperature geothermal resources in the Acoma Basin and Lucero Uplift, eastern Cibola and western Valencia counties, New Mexico: *New Mexico Geological Society Guidebook*, v. 67, p. 263-274.

- Kelley, S., Folsom, M., Keller, S., and Jiracek, G., 2016, Preliminary analysis of complex subsurface temperature variations in the Buckman well field, Santa Fe County, New Mexico: Society of Exploration Geophysicists Technical Program Expanded Abstracts 2016, p. 4941-4945.
- Jacobs, E.P., WoldeGabriel, G., Kelley, S.A., Broxton, D., and Ridley, J., 2016, Volcanism and sedimentation along the western margin of the Rio Grande rift between caldera-forming eruptions of the Jemez Mountains volcanic field, north-central New Mexico: USA: Journal of Volcanology and Geothermal Research, Volume 327, 15, Pages 416-435, ISSN 0377-0273.
- Kelley, S., 2016, A Fortuitous Discovery, *Lite Geology*, Issue 40, p. 1-2.

2015

- Kelley, S.A., 2015, Geothermal potential of the Raton Basin, New Mexico: New Mexico Geological Society Guidebook 66, pp. 261-275.
- Person, M., Kelley, S., Kelley, R., Karra, S., Harp, D., Witcher, J., Bielicki, J., Sutula, G., Middleton, R., Pepin, J. D., 2015, Hydrogeologic windows: Detection of blind and traditional geothermal play fairways in southwestern New Mexico using conservative element concentrations and advective-diffusive solute transport: Geothermal Resources Council Transactions, v. 39, ID 1032216, 9 pp.
- Pepin, J., Person, M., Phillips, F., Kelley, S., Timmons S., Owens, L., Witcher, J., Gable C., 2015, Deep fluid circulation within crystalline basement rocks and the role of hydrologic windows in the formation of the Truth or Consequences, New Mexico low-temperature geothermal system: *Geofluids*, v. 15, p. 139–160, DOI: 10.1111/gfl.12111.
- Ricketts, J.W., Kelley, S.A., Karlstrom, K.E., Schmandt, B. Donahue, M.S., and van Wijk, J., 2015, Synchronous opening of the Rio Grande rift along its entire length at 25–10 Ma supported by apatite (U-Th)/He and fission-track thermochronology, and evaluation of possible driving mechanisms: *Geological Society of America Bulletin*, doi:10.1130/B31223.1
- Ricketts, J.W., Kelley, S.A., Karlstrom, K.E., 2015, Embryonic core complexes in narrow continental rifts: The importance of low-angle normal faults in the Rio Grande rift of central New Mexico *Geosphere*, GES01109.1.

2014

- Karlstrom, K.E., Lee, J. P., Kelley, S.A., Crow, R.,S, Crossey, L.C., Young, R.A., Lazear, G Beard, L.S., Ricketts, J.W., Fox, M., and Shuster, D.L., 2014, Formation of the Grand Canyon 5 to 6 million years ago through integration of older paleocanyons: *Nature Geoscience*, doi:10.1038/ngeo2065.
- Kelley, S., Tewalde, M., Witcher, J., Person, M., 2014, Structural control of warm springs and wells in the Hillsboro-Lake Valley-Palomás Basin region of south-central new Mexico: *Geothermal Resources Council Transactions*, v. 38, p. 133-142.
- Kelley, S., Koning, D.J., Goff, F. Cikoski, C., Peters, L., and McIntosh, W., 2014, Stratigraphy of the northwestern Sierra Blanca volcanic field *in: Geology of the Sacramento Mountains region*, Rawling, Geoffrey, McLemore, Virginia T., Timmons, Stacy, Dunbar, Nelia, New Mexico Geological Society, Guidebook, 65th Field Conference, p. 197-208
- Kelley, S., Engler, T., Cather, M., Pokorny, C., Yang, C.-H., Mamer, E., Hoffman, G., Wilch, J., Johnson, P., and Zeigler, K., 2014, [Hydrologic assessment of oil and gas resource development of the Mancos Shale in the San Juan Basin, New Mexico](#), New Mexico Bureau of Geology and Mineral Resources OFR-566, 65 pp.
- Engler, T. W., Kelley, S., and Cather, M., 2014, [Reasonable foreseeable development \(RFD\) for northern New Mexico](#), New Mexico Bureau of Geology and Mineral Resources OFR-567, 33 pp.
- Sophy, M., and Kelley, S., 2014, Hydrogeologic investigation of the Ojo Caliente and Chise warm springs of the Winston Graben, Rio Grande rift, New Mexico: *Geothermal Resources Council Transactions*, v. 38, p.391-400.
- Koning, D. J., Rawling, G. C., Kelley, S., Goff, F., McIntosh, W., and Peters, L., 2014, Structure and tectonic evolution of the Sierra Blanca Basin, *in: Geology of the Sacramento Mountains region*,

- Rawling, Geoffrey, McLemore, Virginia T., Timmons, Stacy, Dunbar, Nelia, New Mexico Geological Society, Guidebook, 65th Field Conference, p. 209-226.
- Chapin, C.E., Kelley, S.A., and Cather, S.M., 2014, The Rocky Mountain Front, southwestern USA, *Geosphere*, v. 10, no. 5, p. 1043-1060, doi:10.1130/GES01003.1
- Aslan, A., Hood, W. Karlstrom, K. Kirby, E., Granger, D., Kelley, K., Crow, R. Donahue, M., Polyak, V., Asmerom, Y., 2014, Abandonment of Unaweep Canyon (1.4-0.8 Ma), western Colorado: Effects of stream capture and anomalously rapid Pleistocene river incision: *Geosphere* v. 10(3), p. 428-446.
- Rawling, G., Koning, D., Kelley, S., Goff, F., Goff, C., and McLemore, V., 2014, First-day road log: Alamogordo to Three Rivers, Carrizozo, Nogal, Ruidoso and Sierra Blanca Peak *in*: Geology of the Sacramento Mountains region, Rawling, Geoffrey, McLemore, Virginia T., Timmons, Stacy, Dunbar, Nelia, New Mexico Geological Society, Guidebook, 65th Field Conference, p. 1-63.
- Jochems, A. P., Kelley, S. A., Seager, W. R., Cikoski, C. T., Koning, D. J., 2014, [Geologic map of the Hillsboro 7.5-Minute Quadrangle, Sierra County, New Mexico](#), New Mexico Bureau of Geology and Mineral Resources OF-GM-242, Scale 1:24,000.
- Goff, F., Kelley, S. A., Lawrence, J. R. and Goff, C. J., 2014, [Geologic map of the Laguna Cañoneros 7.5-Minute Quadrangle, Cibola and McKinley counties, New Mexico](#), New Mexico Bureau of Geology and Mineral Resources OF-GM-244, Scale 1:24,000.
- Koning, D. H., Jochems, A. P., Kelley, S. A., McLemore, V. T. and Cikoski, C. T., 2014, [Geologic map of the Monticello 7.5-Minute Quadrangle, Sierra and Socorro Counties, New Mexico](#), New Mexico Bureau of Geology and Mineral Resources OF-GM-245, Scale 1:24,000.

2013

- Kelley, S.A., McIntosh, W.C., Goff, F., Kempter, K.A., Wolff, J.A., Esser, R., Braschayko, S., Love, D., and Gardner, J.N., 2013, Spatial and temporal trends in pre-caldera Jemez Mountains volcanic and fault activity, *Geosphere*, v. 9, p. 614-646.
- Kelley, S.A., Kempter, K.A., McIntosh, W. C., Maldonado, F., Smith, G.A., Connell, S.D., Koning, D.J., Whiteis, J., 2013, Syndepositional deformation and provenance of Oligocene to Lower Miocene sedimentary rocks along the western margin of the Rio Grande rift, Jemez Mountains, New Mexico: in Mark R. Hudson and V.J.S. Grauch (eds.), *New Perspectives on Rio Grande Rift Basins: From Tectonics to Groundwater: Geological Society of America Special Paper 494*, p. 101-124.
- Cather, S.M., Zeigler, K.E., Mack, G.H. and Kelley, S.A., 2013, Toward standardization of Phanerozoic stratigraphic nomenclature in New Mexico: *Rocky Mountain Geology*, v. 48, p. 101-124, doi:10.2113/gsrocky.48.2.101.
- Karlstrom, K.E., Lee, J. , Kelley, S., Crow, R., Young, R.A., Lucchitta, I., Beard, L.S., Dorsey, R., Ricketts, J.W., Dickinson, W.R., Crossey, L., 2013, Comment on “Apatite $^4\text{He}/^3\text{He}$ and (U-Th)/He Evidence for an Ancient Grand Canyon: *Science*, v. 340, p. 143, DOI: 10.1126/science.1233982.
- Niemi, N.A., Buscher, J.T., Spotila, J.A., House, M.A., Kelley, S.A., 2013, Insights from low-temperature thermochronometry into transpressional deformation and crustal exhumation along the San Andreas fault in the western Transverse Ranges, California: *Tectonics*, v. 32, p. 1602–1622.
- Person, M., Phillips, F., Kelley, S., Timmons, S., 2013, Assessment of the Sustainability of Geothermal Development within the Truth or Consequences Hot-Springs District, New Mexico, New Mexico Bureau of Geology and Mineral Resources Open-file Report 551, 65 pp.

2012

- Kelley, S.A., and Karlstrom, K.E., 2012, The Laramide and post-Laramide uplift and erosional history of the eastern Grand Canyon: Evidence from apatite fission-track thermochronology, *in* Timmons, J.M., and Karlstrom, K.E., eds., *Grand Canyon Geology: Two Billion Years of Earth’s History: Geological Society of America Special Paper 489*, p. 109–117, doi:10.1130/2012.2489(07).
- Kelley, S.A., 2012, Conceptual models of the Rio Grande rift: *Lite Geology*, no. 31, p. 2-5.

- Kelley, S.A. and Chamberlin, R.C., 2012, Our growing understanding of the Rio Grande rift: New Mexico Earth Matters, v. 12, no.2, p. 1-4.
- Cather, S.M., Chapin, C.E., and Kelley, S.A., 2012, Diachronous episodes of Cenozoic erosion in southwestern North America and their relationship to surface uplift, paleoclimate, paleodrainage, and paleoaltimetry: *Geosphere*, December 2012, v. 8, p. 1177-1206, first published on October 18, 2012, doi:10.1130/GES00801.1
- Erikson, J.P., Kelley, S.A., Osmolovsky, P., Verosub, K.L., 2012, Linked basin sedimentation and orogenic uplift: The Neogene Barinas basin sediments derived from the Venezuelan Andes: *Journal of South American Earth Sciences*, v. 39, p. 138-156.
- Flowers, R.M., Ault A.K., Kelley, S.A. Zhang, N, Zhong, S., 2012, Epeirogeny or eustasy? Paleozoic–Mesozoic vertical motion of the North American continental interior from thermochronometry and implications for mantle dynamics: *Earth and Planetary Science Letters*, Volumes 317–318, p. 436-445.
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2011

- Huang, L, Kelley, S. Zhang, Z., Rehfeldt, K., Albrecht, M., Kaufman, G., 2011, Imaging faults with reverse-time migration for geothermal exploration at Jemez Pueblo in New Mexico: Los Alamos National Laboratory Report LA-UR-11-10640, 11 p.
- Albrecht M., Goff F., Gardner J., Kelley S., WoldeGabriel G., Dewhurst W., Sirles P., Kaufman G., 2011: Multi-disciplined geothermal exploration at the Pueblo of Jemez, New Mexico, Proceedings, Geothermal Research Council Annual Meeting, California, San Diego, 2011.
- Flowers, R.M., and Kelley, S.A., 2011, Interpreting data dispersion and "inverted" dates in apatite (U-Th)/He and fission-track datasets: An example from the US midcontinent: *Geochimica et Cosmochimica Acta* 75, p. 5,169-5,186.
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- Goff, F., Kelley, S. A., Lawrence, J. R., Cikowski, C. T., Krier, D., Goff, C. J., McLemore, V. T., 2011, [Preliminary geologic map of the Nogal Peak 7.5-minute quadrangle, Lincoln and Otero Counties, New Mexico](#), New Mexico Bureau of Geology and Mineral Resources Geologic Map, OF-GM-134 Scale 1:24,000.
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2010

- Kelley, S.A.. 2010, The Colorado Plateau *in* The Geology of Northern New Mexico's Parks, Monuments, and Public Lands, L.G. Price, ed., New Mexico Bureau of Geology and Mineral Resources, p. 19-23.
- Kelley, S.A.. 2010, The Great Plains *in* The Geology of Northern New Mexico's Parks, Monuments, and Public Lands, L.G. Price, ed., New Mexico Bureau of Geology and Mineral Resources, p. 309-312.
- Kelley, S.A.. 2010, Gilman Tunnels *in* The Geology of Northern New Mexico's Parks, Monuments, and Public Lands, L.G. Price, ed., New Mexico Bureau of Geology and Mineral Resources, p. 177-181.
- Kelley, S.A.. 2010, Petroglyph National Monument *in* The Geology of Northern New Mexico's Parks, Monuments, and Public Lands, L.G. Price, ed., New Mexico Bureau of Geology and Mineral Resources, p. 209-216.
- Kelley, S.A. and Price, L.G., 2010, Fenton Lake State Park *in* The Geology of Northern New Mexico's Parks, Monuments, and Public Lands, L.G. Price, ed., New Mexico Bureau of Geology and Mineral Resources, p. 173-176.
- Hunt, A.P., and Kelley S.A., 2010, Ghost Ranch and vicinity *in* The Geology of Northern New Mexico's Parks, Monuments, and Public Lands, L.G. Price, ed., New Mexico Bureau of Geology and Mineral Resources, p. 113-124.
- McLemore, V.T., and Kelley, S.A., 2010, Red Rock State Park *in* The Geology of Northern New Mexico's Parks, Monuments, and Public Lands, L.G. Price, ed., New Mexico Bureau of Geology and Mineral Resources, p. 45-49.
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2009

- Kelley, S.A., Chapin, C.E., Cather, S.M., and Person, M., 2009, Thermal history of the eastern Socorro Basin, Socorro County, New Mexico, based on apatite fission-track thermochronology: New Mexico Geological Society Guidebook 60, p. 121-132.
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- Koning, D., Kelley, S.A., and Kempter, K., 2009, Preliminary geologic map of the Tularosa NE 7.5 minute quadrangle, Otero County, New Mexico: New Mexico Bureau of Geology and Mineral Resources Geologic Map, OF-GM-185, Scale 1:24,000.

Osburn, G.R, Goff, F., Kelley, S.A., and Ferguson, C.A., 2009, Preliminary geologic map of the Mt. Taylor 7.5 minute quadrangle, Cibola County, New Mexico: New Mexico Bureau of Geology and Mineral Resources Geologic Map, OF-GM-186, Scale 1:24,000.

2008

Goff, Fraser, Kelley, Shari A., Zeigler, Kate, Drakos, Paul, Goff, Cathy, 2008, [Preliminary geologic map of the Lobo Springs Peak 7.5-minute quadrangle map, Cibola County, New Mexico](#), New Mexico Bureau of Geology and Mineral Resources Geologic Map, OF-GM-181, Scale 1:24,000

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