

J. Michael Timmons

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Personal Information: Born December 16, 1969, U.S. citizen

Education:

Ph.D., 2004, Geology, University of New Mexico, "Mesoproterozoic Tectonic evolution of southwestern North America: protracted intracratonic deformation, sedimentation, and differential exhumation in Grand Canyon and the Rocky Mountain Region"

M.S., 1999, Geology, University of New Mexico, "Proterozoic multistage (~1.1 and ~0.8 Ga) extension in the Grand Canyon Supergroup and establishment of northwest and north-south tectonic grains in the southwestern United States"

B.S., 1995, Geology, University of Nebraska at Omaha, "Geology of the Monte Largo Hills area, New Mexico: structural and metamorphic study of the eastern aureole of the Sandia pluton"

Professional Experience:

2014-present **Deputy Director, New Mexico Bureau of Geology and Mineral Resources.** Principal Duties: Provide support to the Director/State Geologist in planning and strategy for the bureau. Outreach to legislators, regulators, and other decision-makers. Promote bureau research in outreach to the public and other science agencies.

2022-2023 **Interim Director and State Geologist, New Mexico Bureau of Geology and Mineral Resources.** Principal Duties: Provide leadership in all aspects of research and operations at the agency. Provide leadership in planning and strategy for the bureau. Outreach to legislators, regulators, and other decision-makers. Promote bureau research in outreach to the public and other science agencies. Directly reports to the President of New Mexico Tech and the Board of Regents.

- 2010-present **Associate Director for Mapping Programs, New Mexico Bureau of Geology and Mineral Resources.** Principal Duties: Supervise mapping and GIS staff and manage mapping-related activities at the New Mexico Bureau of Geology. Duties include: Supervise geologic field staff and GIS map production staff (currently 10 personnel)
- 2010-present **Adjunct Faculty at New Mexico Tech.** Geologic mapping and field-based studies of the Colorado Plateau, including stratigraphic, sedimentological, structural, and tectonic studies.
- 2016-present **Adjunct Faculty at Utah State University.** Geologic mapping and field-based studies of the Mesoproterozoic of the Southwestern U.S.
- 2004-2010 **Manager of New Mexico Geologic Mapping Program, New Mexico Bureau of Geology and Mineral Resources.** Principal Duties: Supervise mapping and mapping-related activities at the New Mexico Bureau of Geology. Duties include 1) Project management and administration. Establish mapping responsibilities for Bureau personnel and contract mappers. Manage and track the annual mapping budget. Manage timely completion and distribution of contract deliverables and open-file map products. 2) Proposal preparation. Set up contracts, construct budgets, and negotiate fees with mapping contractors. Set mapping priorities by coordinating with state and federal agencies, defining the scope of work, overseeing mapping personnel, and coordinating land access issues. 3) Field Management and technical oversight. Coordinate efforts of individual mappers in multi-author quadrangles. Review final map products. Coordinate production of digital geologic maps with GIS and cartography sections.
- 2004-2023 **Field Geologist, New Mexico Bureau of Geology and Mineral Resources.** Principal Duties: Field Geology. Using geologic mapping techniques and field observations to resolve the distribution, deformation and depositional history of bedrock units. Specific emphasis on structural geology and research in Precambrian and Ancestral Rockies geology.

- 1996-2004 **University of New Mexico, Teaching Assistant:** Structure Geology (EPS 307) Advanced Field Geology (EPS 420) Physical Geology (EPS 105L) New Mexico Field Geology (EPS 310)
Research Assistant, Neoproterozoic of the Grand Canyon, Mesoproterozoic structural evolution of the continental interior, and persistence of structural weaknesses through geologic time.
- 1995 **New Mexico Bureau of Mines and Mineral Resources: Contract Mapper:** Sandia Park and Truchas quadrangles
- 1989 to 2004 **Grand Canyon River Guide/Interpreter** This experience is included to demonstrate diverse instructional background and ability to communicate with a large variety of people with an equally large variety of scientific backgrounds.

Teaching Experience:

Summer Semester 2010 to 2020: NM Tech Field Camp: Guest instructor. Provide logistical support, instruction and guidance on mapping projects in the Rio Chama corridor.

Spring Semester 2012: Advanced Topics in Geology: Geology of the Grand Canyon Region: Duties include: design and prepare all exercises, report and lectures for seminar course.

Spring Semester 1996, 1998, 2000: Structural Geology teaching assistant: Duties include: design and prepare laboratory exercises, instruction of laboratory projects, 3 hours per week office hours, participate in field exercises, grade lab exercises and assign final grades.

Fall Semester 1997, 2002 Spring Semester 2002: Physical Geology Laboratory Instructor: Introduction to Geology reaches out to two different students: career-track geologists and non-geology degree seeking students. In this light, Introduction to Geology, when taught with enthusiasm, can be used successfully as a platform to attract undecided majors towards geology. Duties include: preparation of laboratory exercises, instruction of laboratory projects, 3 hours per week office hours, participate in field exercises, grade lab exercises and assign final grades.

Summer Session 1997, 1998, 1999, 2000, 2001, 2002: Advanced Field Geology Instructor (graduate level field course): Duties include: Reconnoiter and help design field exercises, plan and implement logistical support for field projects (including: lodging/camping, food, transportation, etc.), instruct students on field based techniques for geologic mapping (this includes:

compilation of existing mapping, using remote sensing data in the field to compliment field observations, and making geologic maps). Field based projects are multidisciplinary, from Precambrian metamorphic rocks to Quaternary deposits.

Spring and Fall Semesters 2003: New Mexico Field Geology teaching assistant:

The course involves weekly fieldtrips to nearby scenic areas such as the Sandia Mountains, central Rio Grande rift, Albuquerque volcanoes, Colorado Plateau, Albuquerque Basin, and Jemez Mountains. Observations, rock identification, note taking, and other field methods (introductions to compass use, section description, and mapping) are taught in the field. This course offers an important opportunity to expose introductory students to basic field methods at classic localities in New Mexico and further broadened my experience in New Mexico geology.

Professional Interests:

- Field geology
- Structural geology
- Grand Canyon Geology
- Mid-Late Proterozoic Geology of western North America
- Basement cooling histories determined from $^{40}\text{Ar}/^{39}\text{Ar}$ thermochronologic studies
- Proterozoic ancestry of Phanerozoic deformational structures in the Southwest
- Brittle structural history of the southern Sangre de Cristo Mountains, New Mexico
- Ancestral Rocky Mountain deformation in New Mexico and Colorado
- Proterozoic geology of New Mexico, with emphasis on structure and tectonics
- Applied sedimentology to structural problems in sedimentary rocks

Publications:

Refereed Journals:

Dehler, C. A., Schmitz, M. D., ; Bullard, A., Porter, S. A. Karlstrom, K. E., **Timmons**, J. M., and Cothren, H., in press, Precise U-Pb age models refine Neoproterozoic western Laurentian rift initiation, correlation, and Earth system changes, *Precambrian Research*, Volume 396, 2023, 107156, ISSN 0301-9268, <https://doi.org/10.1016/j.precamres.2023.107156>.

Karlstrom, K. E., Guenther, W. R., Thurston, O. G., Heizler, M. T., Ricketts, J. W., **Timmons**, J. M., 2022, Zircon (U-Th)/He thermochronology reveals pre-Great Unconformity paleotopography in the Grand Canyon region, USA Comment, *Geology*, V. 50, No. 3, DOI 10.1130/G49843C.1. <https://doi.org/10.1130/G49843C.1>

Thurston, O. G., Guenther, W. R., Karlstrom, K. E., Ricketts, J. W. Heizler, M. T., **Timmons**, J. M., 2022, Zircon (U-Th)/He thermochronology of Grand Canyon resolves 1250 Ma unroofing at the Great Unconformity and < 20 Ma canyon carving, *Geology*, v. 50, n. 2, pp. 222-226, DOI 10.1130/G48699.1 <https://doi.org/10.1130/G48699.1>

Ricketts, J. W., Roiz, J., Karlstrom, K. E., Heizler, M. T., Guenther, W. R., and **Timmons**, J. M., 2021, Tectonic origin of the Great Unconformities of the Rocky Mountain region: the power of combined zircon (U/Th)-He and K-feldspar ⁴⁰Ar/³⁹Ar thermochronology, *Geology*, v. 49, n. 10, pp. 1187-1192. <https://doi.org/10.1130/G49141.1>

Karlstrom, K.E., Crossey, L.C., Huntoon, P., Billingsley, G., **Timmons**, M., Crow, R., 2019, One Hundred and Sixty Years of Grand Canyon Geological Mapping, *Journal of Arizona History*, v. 60., n. 4 (Winter 2019), pp. 655-674.

Mulder, J., Karlstrom, K. E., Fletcher, K., Heizler, M., **Timmons**, J. M., Crossey, L., Gehrels, G. and Pecha, M., 2017, The syn-orogenic sedimentary record of the Grenville Orogeny in southwest Laurentia, *Precambrian Research*, v. 294, pp. 33-52. <https://doi.org/10.1016/j.precamres.2017.03.006>

Dehler, C. Gehrels, G. Porter, S., Heizler, M., Karlstrom, K., Cox, G., Crossey, L., **Timmons**, M., 2017, Synthesis of the 780-740 Ma Chuar, Uinta Mountain, and Pahrump (ChUMP) groups, western USA; implications for Laurentia-wide cratonic marine basins. *Geological Society of America Bulletin*, February 17, 2017, Vol. Pre-Issue Publication. <https://doi.org/10.1130/B31532.1>

Kinzli, K., Shafike, N., Bauer, P., Lundahl, A., Schmidt-Petersen, R., Harris, S., Lewis, G., Johnson, P., and **Timmons**, J.M., 2013, Quantifying river accretion in the upper Rio Grande gorge, New Mexico, by using an

acoustic Doppler current profiler, River Research and Applications, Vol. 29, Issue 1, pp. 4-16. <https://doi.org/10.1002/rra.1581>

Gehrels, G. E, Blakey, R., Karlstrom, K. E., **Timmons**, J. M., Dickinson, B., and Pecha, M., 2011, Detrital zircon U-Pb geochronology of Paleozoic strata in the Grand Canyon, Arizona, Lithosphere, v. 3, n. 3, pp. 183-200. <https://doi.org/10.1130/L121.1>

Cather, S. M., Read, A. S., Krainer, K., Kelley, S. A., Kues, B. S., Allen, D. B., **Timmons**, J. M., 2007, Analysis of proximal syntectonic Pennsylvanian deposits yields definitive evidence of major Phanerozoic slip on Picuris-Pecos Fault, north-central New Mexico, New Mexico Geology, Vol. 29, Issue 2, pp. 57. <https://doi.org/10.56577/SM-2007.917>

Bloch, J. D., **Timmons**, J. M., Crossey, L. J., Gehrels, G. E., and Karlstrom, K. E., 2006, Mudstone petrology of the Mesoproterozoic Unkar Group, Grand Canyon: Provenance, weathering, and sediment transport on intracratonic Rodinia, Journal of Sedimentary Research, 76, pp. 1106-1119. <https://doi.org/10.2110/jsr.2006.107>

Cather, S. M., Karlstrom, K. E., **Timmons**, J. M., and Heizler, M. T., 2006, A Palinspastic Reconstruction of Proterozoic basement-related aeromagnetic features in north-central New Mexico: Implications for Mesoproterozoic to Late Cenozoic tectonism, Geosphere, v. 2; no. 6; pp. 299-323. <https://doi.org/10.1130/GES00045.1>

Timmons, J. M., Karlstrom, K. E., Heizler, M. T., Bowring, S. A., Gehrels, G. E., and Crossey, L. J., 2005, Tectonic inferences from the ca. 1254 -1100 Ma Unkar Group and Nankoweap Formation, Grand Canyon: Intracratonic deformation and basin formation during protracted Grenville orogenesis, Geological Society of America Bulletin, v.117, no.11/12, p. 1573-1595. <https://doi.org/10.1130/B25538.1>

Dehler, C. M., Elrick, M., Karlstrom, K. E., Smith, G. A., Crossey, L. J., and **Timmons**, J. M., 2001, Neoproterozoic Chuar Group (~800-742 Ma), Grand Canyon: a Record of Cyclic Marine Deposition During Global Cooling and Supercontinent Rifting, Sedimentary Geology 141-142, p. 465-499. [https://doi.org/10.1016/S0037-0738\(01\)00087-2](https://doi.org/10.1016/S0037-0738(01)00087-2)

Timmons, J. M., Karlstrom, K. E., Dehler, C. M., Geissman, J. W., Heizler, M. T.; Proterozoic multistage (ca. 1.1 and 0.8 Ga) extension recorded in the Grand Canyon Supergroup and establishment of northwest- and north-trending tectonic grains in the southwestern United States. *GSA Bulletin* 2001;; 113 (2): 163–181. doi: [https://doi.org/10.1130/0016-7606\(2001\)113<0163:PMCAGE>2.0.CO;2](https://doi.org/10.1130/0016-7606(2001)113<0163:PMCAGE>2.0.CO;2)

Marshak, S., Karlstrom, K. E., **Timmons**, J. M., 2000, Inversion of Proterozoic extensional faults; an explanation for the pattern of Laramide and ancestral Rockies intracratonic deformation, United States, *Geology*, v. 28, no. 8, p. 735-738. doi: [https://doi.org/10.1130/0091-7613\(2000\)028<0735:IOPEFA>2.3.CO;2](https://doi.org/10.1130/0091-7613(2000)028<0735:IOPEFA>2.3.CO;2)

Karlstrom, K. E., Bowring, S. A., Dehler, C. M., Knoll, A. H., Porter, S. M., Sharp, Z. D., Des Marais, D. J., Weil, A. B., Geissman, J. W., Elrick, M. B., **Timmons**, J. M., Keefe, K., Crossey, L. J., 2000, The Chuar Group of the Grand Canyon: record of break up of Rodinia, associated change in the global carbon cycle, and ecosystem expansion by 740 Ma, *Geology*, v. 28, no. 7, p. 619-622. [https://doi.org/10.1130/0091-7613\(2000\)028<0619:CGOTGC>2.3.CO;2](https://doi.org/10.1130/0091-7613(2000)028<0619:CGOTGC>2.3.CO;2)

Andronicos, C.L., Karlstrom, K.E., Nyman, M.W., Kirby, E., and **Timmons**, J.M., 1999, Interactions of metamorphism, deformation, and plutonism in low-pressure, high-temperature metamorphic belts: an example from the Mesoproterozoic Sandia Pluton, New Mexico, U.S.A.: *Journal of Metamorphic Geology*.

Books and Edited Volumes:

Bauer, P.W., Zimmerer, M., **Timmons**, J. M., Felix, B. and Harris, S., 2021, *The Rio Chama: A River Guide to the Geology and Landscapes*, Field Guide, New Mexico Bureau of Geology and Mineral Resources, 134 pp.

Zeigler, K., **Timmons**, J.M., Timmons, S.S., Semken, S., 2013, *Geology of Route 66 Region: Flagstaff to Grants*: New Mexico Geological Society

- Guidebook, 64th Annual Field Conference, 117 pp.
<https://doi.org/10.56577/FFC-64>
- Timmons**, J. M., Dehler, C., Karlstrom, K. E., Crossey, L., and Porter, S., 2013, The Grand Canyon Supergroup: A glimpse into mysteries of the Great Unconformity: New Mexico Geological Society Guidebook, 64th Annual Field Conference, pp. 5-7. Doi: <https://doi.org/10.56577/FFC-64.9>
- Zeigler, K, Riggs, N., **Timmons**, J. M., Ort, M, and Semken, S., 2013, First-day road log: From Flagstaff to S P and Colton Craters, Wupatki and Sunset Crater National Monuments and Meteor Crater: New Mexico Geological Society Guidebook, 64th Annual Field Conference, pp. 9-24.
<https://doi.org/10.56577/FFC-64.9>
- Parker, W., Martz, J., Zeigler, K., Semken, S., and **Timmons**, J. M., 2013, Second-day road log: From a corner in Winslow, Arizona, through Petrified Forest National Park, to the El Rancho Hotel in Gallup, New Mexico: New Mexico Geological Society Guidebook, 64th Annual Field Conference, pp. 25-42. <https://doi.org/10.56577/FFC-64.25>
- Zeigler, K., **Timmons**, J. M., and Semken, S., 2013, Third-day road log: Pre-trip - From El Rancho Hotel, Gallup, NM to Northwest Regional Visitor's Center in Grants, NM: New Mexico Geological Society Guidebook, 64th Annual Field Conference, pp. 50-53. <https://doi.org/10.56577/FFC-64.50>
- Cikoski, C. T., Koning, D. K., Zeigler, K., and **Timmons**, J. M., 2013, Third-day road log: Post-meeting optional road log - Grants to the Rio Puerco: New Mexico Geological Society Guidebook, 64th Annual Field Conference, pp. 86-96. <https://doi.org/10.56577/FFC-64.86>
- Timmons**, J. M. and Karlstrom K. E. eds., 2012, Grand Canyon Geology: Two Billion Years of Earth's History, Geological Society of America Special Paper 489. <https://doi.org/10.1130/SPE489>
- Karlstrom, K. E., **Timmons**, J. M., and Crossey, L. J., 2012, Introduction to Grand Canyon Geology 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.
[https://doi.org/10.1130/2012.2489\(00\)](https://doi.org/10.1130/2012.2489(00))

Timmons, J.M., Bloch, J.D., Fletcher, K.E., Karlstrom, K.E., Heizler, M.T., Gehrels, G., Crossey, L.J., 2012, The Grand Canyon Unkar Group: Mesoproterozoic basin formation in the continental interior during supercontinent assembly, 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. [https://doi.org/10.1130/2012.2489\(02\)](https://doi.org/10.1130/2012.2489(02))

Dehler, C.M., Porter, S., and **Timmons**, J.M., 2012, The Neoproterozoic Earth System Revealed From the Chuar Group of Grand Canyon, 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. [https://doi.org/10.1130/2012.2489\(03\)](https://doi.org/10.1130/2012.2489(03))

Karlstrom, K. E. and **Timmons**, J. M., 2012, Many Unconformities make one Great Unconformity, 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. [https://doi.org/10.1130/2012.2489\(04\)](https://doi.org/10.1130/2012.2489(04))

Karlstrom, K. E. and **Timmons**, J. M., 2012, Faulting and Uplift in the Grand Canyon Region, 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. [https://doi.org/10.1130/2012.2489\(06\)](https://doi.org/10.1130/2012.2489(06))

Karlstrom, K. E., Crossey, L. J., and **Timmons**, J. M., 2012, Afterword, 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. [https://doi.org/10.1130/2012.2489\(10\)](https://doi.org/10.1130/2012.2489(10))

Cather, S. M., **Timmons**, J. M., and Karlstrom, K. E., 2005, Regional Tectonic Inferences for the 1.4 Ga-Holocene lateral slip history of the Picuris-Pecos and related faults, Northern New Mexico: New Mexico Geological Society Guidebook, 56th Annual Field Conference, Geology of the Chama Basin, p. 93-104. <https://doi.org/10.56577/FFC-56.93>

Timmons, J.M., Karlstrom, K.E., and Sears, J., 2003, Geologic structure of the Grand Canyon Supergroup, in Beus, S. S., and Morales, M., eds., Grand

Canyon Geology, second edition, Oxford Univ. Press, New York, NY |
Museum of North. Arizona Press, p. 71-82.

Timmons, J.M., Karlstrom, K.E., Kirby, E., 1995, Geology of the Monte Largo Hills area, New Mexico: Structural and metamorphic study of the eastern aureole of the Sandia Pluton: New Mexico Geological Society Guidebook, 46th Annual Field Conference, Santa Fe region, p. 227-232.
<https://doi.org/10.56577/FFC-46.227>

Geologic Maps:

Aby, S. and **Timmons**, J. M., 2018, Geologic map of the Tierra Amarilla 7.5 minute quadrangle, Rio Arriba County, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map 268, scale 1:24,000. <https://doi.org/10.58799/OF-GM-268>

Aby, S. and **Timmons**, J. M., 2017, Geologic map of the Heron Reservoir 7.5 minute quadrangle, Rio Arriba County, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map 264, scale 1:24,000. <https://doi.org/10.58799/OF-GM-264>

Aby, S. and **Timmons**, J. M., 2016, Geologic map of the El Vado 7.5 minute quadrangle, Rio Arriba County, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map 257, scale 1:24,000. <https://doi.org/10.58799/OF-GM-257>

Allen, B. D.; **Timmons**, J. M., Luther, A. L.; Miller, P. L.; Love, D. W., 2014, Geologic map of the Cerro Montoso 7.5-minute quadrangle, Socorro County, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map 238, scale 1:24,000.
<https://doi.org/10.58799/OF-GM-238>

Timmons, J. M., and Cikoski, C. T., 2012, Geologic map of the San Rafael quadrangle, Cibola County, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map 232, scale 1:24,000. <https://doi.org/10.58799/OF-GM-232>

Timmons, J. M., 2010, Geologic map of the Nelson Canyon West Quadrangle, Lincoln County, New Mexico: New Mexico Bureau of

Geology and Mineral Resources, Open-file Geologic Map OFGM 197, scale 1:24,000.

<https://doi.org/10.58799/OF-GM-197>

Timmons, J. M., 2008, Geologic Map of the Flying H NW 7.5-minute quadrangle, Lincoln and Chaves Counties, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map OFGM 173, scale 1:24,000. <https://doi.org/10.58799/OF-GM-173>

Timmons, J. M., Karlstrom, K.E., Pederson, J., and Anders, M., 2007, Geologic Map of the Butte Fault / East Kaibab Monocline Area, Eastern Grand Canyon, Arizona, Grand Canyon Association, 1:24,000.

Horn, M. and **Timmons**, J.M., 2006, Geologic Map of the Ojitos Frios 7.5-minute quadrangle, San Miguel County, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map OFGM 130, scale 1:24,000. <https://doi.org/10.58799/OF-GM-130>

Aby, S., and **Timmons**, J.M., 2005, Geologic map of the El Valle 7.5-minute quadrangle, Rio Arriba, Taos, and Santa Fe Counties, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map OFGM 105, scale 1:24,000. <https://doi.org/10.58799/OF-GM-105>

Smith, G.A., **Timmons**, M., and Gaud, M., 2004, Geologic Map of the Truchas 7.5-minute quadrangle, Rio Arriba and Santa Fe Counties, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map OFGM 84, scale 1:24,000. <https://doi.org/10.58799/OF-GM-84>

Ferguson, C.A., **Timmons**, J.M., Pazzaglia, F.J., Karlstrom, K.E., and Bauer, P.W., 1996 (last revised: 31 August 1999), Geologic Map of the Sandia Park 7.5-minute quadrangle, Bernalillo and Sandoval Counties, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Open-file Geologic Map OFGM 1, scale 1:24,000. <https://doi.org/10.58799/OF-GM-1>

- **Geologic Maps in progress:**

Billingsley, G.E., Crow, R., **Timmons**, J. M., Karlstrom, K.E. (anticipated 2023), Geologic map of the Grand Canyon 30x60 Sheet, Grand Canyon, Arizona.

Open File Reports:

Newton, T., Timmons, S., Rawling, G., Partey, F., Kludt, T., Land, L., **Timmons**, M., Walsh, P., 2009, Sacramento Mountains Hydrogeology Study, New Mexico Bureau of Geology and Mineral Resources, Open-File Report 518, 64 p.

B. T. Newton, G. C. Rawling, S. S. Timmons, L. Land, P. S. Johnson, T. J. Kludt, and J. M. **Timmons**, 2012, Sacramento Mountains Hydrogeologic Study: Final technical report. Prepared for Otero Soil and Water Conservation District, NM Bureau of Geology and Mineral Resources Open File Report 543, 77pp. <https://doi.org/10.58799/OFR-512>

Abstracts:

Crow, R, Karlstrom, K. E., **Timmons**, J. M., Ranney, W., Kaplinski, M., Billingsley, G. and Gushue, T., 2022, Refining and Seamlessly Compiling the Next Generation of Grand Canyon Maps, In GSA Annual Meeting in Denver, Colorado, USA-2022. GSA. <https://doi.org/10.1130/abs/2022AM-380586>

Timmons, J.M., Karlstrom, K.E., Lathrop, E.C., Mohr, M.T., Schmitz, M.D., Dehler, C.M., Anderson, J.C. and Crossey, L.J., 2019, A Glimpse Within the Great Unconformity: Parsing the Mesoproterozoic Record of Erosion, Sedimentation and Deformation preserved in the Grand Canyon Unkar Group. In GSA Annual Meeting in Phoenix, Arizona, USA-2019. GSA. <https://doi.org/10.1130/abs/2019AM-340738>

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Dehler, C.M., Schmitz, M.D., Bullard, A.R., Blakey, R., Karlstrom, K.E. and **Timmons**, J.M., 2019, Late Tonian paleogeography of Southwestern

North America. In GSA Annual Meeting in Phoenix, Arizona, USA-2019. GSA. <https://doi.org/10.1130/abs/2019AM-340459>

Karlstrom, K.E., Heizler, M.T., Schmitz, M., Mohr, M.T., Crossey, L.J., Dehler, C.M., **Timmons**, J.M. and Hagadorn, J.W., 2019, Parsing Grand Canyon's Great Unconformity--Composite Erosion Surface from at Least Three Episodes Between 1,350 AND 508 MA. In GSA Annual Meeting in Phoenix, Arizona, USA-2019. GSA. <https://doi.org/10.1130/abs/2019AM-332195>

Schmitz, M.D., Trayler, R.B., Mohr, M.T., Dehler, C.M., Karlstrom, K.E., Crossey, L.J., Hagadorn, J.W. and **Timmons**, J.M., 2019, Bayesian Age Modeling and Integrative Chronostratigraphy of the Chuar and Tonto Groups of the Grand Canyon. In GSA Annual Meeting in Phoenix, Arizona, USA-2019. GSA. <https://doi.org/10.1130/abs/2019AM-341258>

Roiz, J., Ricketts, J.W., Heizler, M.T., **Timmons**, J.M. and Karlstrom, K.E., 2019, Investigating the Nature of Continental Erosion Along the Great Unconformity Using Zircon (U-Th)/He and $^{40}\text{Ar}/^{39}\text{Ar}$ Thermochronology in the Rocky Mountains: Is the Great Unconformity a Compound Surface of Multiple Erosional Events?. In GSA Annual Meeting in Phoenix, Arizona, USA-2019. GSA.

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Mexico's 21st Century Resource Challenges, Geological Society of America Abstracts with Programs, Vol. 41, No. 7, p. 39.

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Timmons, J.M. and Karlstrom, K.E., 1999, Multistage Proterozoic extension and establishment of the N-S and NW tectonic grains in the southwestern United States: Evidence from 1:12,000 mapping of the Grand Canyon Supergroup, Geological Society of America Abstracts with Programs, v. 31, n. 7, p. 177.

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Timmons, J.M., 1996, Evidence for 1.4 Ga metamorphism and deformation in the aureole of the Sandia Pluton, Monte Largo Hills Area, New Mexico, New Mexico Geological Society 1996 Annual Spring Meeting Proceedings Volume, p. 44.

Timmons, J.M., Shuster, R.D., Karlstrom, K.E., 1995, Geology of the Monte Largo Hills area, New Mexico: Structural and Metamorphic study of the eastern aureole of the Sandia Pluton: GSA Abstracts with Programs, v.27, n. 3, p.90.
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Thesis:

Timmons, J. M., 1999, Proterozoic multistage (~1.1 and ~0.8 Ga) extension in the Grand Canyon Supergroup and establishment of northwest and north-south tectonic grains in the southwestern United States, Masters Thesis, University of New Mexico.

Dissertation:

Timmons, J. M., 2004, Mesoproterozoic Tectonic evolution of southwestern North America: protracted intracratonic deformation, sedimentation, and differential exhumation in Grand Canyon and the Rocky Mountain Region, [Dissertation], University of New Mexico.

Public Outreach:

Timmons, J.M., 2020, The Unkar Group of Grand Canyon, a billion year old glimpse within the Great Unconformity and a unique perspective of supercontinent assembly, Grand Canyon Geology Festival (Geofest 2020)", Grand Canyon National Park virtual presentations, October 11-17.

Timmons, J. M., 2017, Mysteries of the Great Unconformity, a Journey in Deep Geologic Time, New Mexico Earth Matters, NMBGMR, V. 17, No. 1, 5 pp.

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Timmons, J.M., Karlstrom, K.E., Dehler, C.M., 1999, Grand Canyon Supergroup: six unconformities make one 'Great Unconformity' - a record of supercontinent assembly and disassembly; Boatman's Quarterly Review, Grand Canyon River Guides.

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Grand Canyon River Guides training trip 1999, invited speaker on Grand Canyon Geology.

Interview with BBC Radio 'An Earth Made for Life' at
<http://www.bbc.co.uk/radio4/science/earthmadeforlife.shtml>

Journal Papers Reviewed:

Detrital Mineral Chronology of the Uinta Mountain Group: Implications for the Origin of Mesoproterozoic Detritus in Southwestern Laurentia, Geology

Corresponding Author: Paul Mueller. **Contributing Authors:** David Foster, Joe Wooden, James Vogl, David Mogk, George Kamenov

Research Proposals Reviewed:

2006 For the National Park Service: Lithostratigraphic Study of Unkar Group for Evidence of Rapid Sedimentation, applicant: Mr. Bruce H. Wendler

2007 For the National Park Service: Possible multiple injections of magma in the Unkar Sill at Stone Creek, applicant: Gerald Osborn

Contracts and Grants:

Current Contracts:

- 2022-2024 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geologic Mapping in New Mexico; P.I. J. Michael **Timmons**, U.S. Geological Survey: **\$668,850 awarded.**
- 2021-2023 Geologic Review of the Aztec 1°x2° Geologic Map and Geodatabase, P.I. J. Michael **Timmons**, U.S. Geological Survey: **\$93,703 awarded.**
- 2017-2023 WIPP Seismic Monitoring; P.I. Shane Ingate, Mairi Litherland and J. Michael **Timmons**, Nuclear Waste Partnership LLC: **\$823,728 awarded.**

Previously funded Contracts:

- 2021-2022 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. J. Michael **Timmons**, U.S. Geological Survey: **\$583,603 awarded.**
- 2021-2022 Jicarilla Apache Nation, Study to Address Sedimentation and Erosion Impacting Infrastructure on the Southern Jicarilla Apache Nation, New Mexico; P.I. J. Michael **Timmons**: **\$250,968.80 awarded.**

- 2019-2021 National Park Service; Geologic Mapping of the Guadalupe Mountains and Carlsbad Caverns National Parks; P.I. J. Michael **Timmons**, \$51,243 awarded.
- 2020-2021 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. J. Michael **Timmons**, U.S. Geological Survey: \$399,242 awarded.
- 2019-2020 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. J. Michael **Timmons**, U.S. Geological Survey: \$149,924 awarded.
- 2018-2019 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. J. Michael **Timmons**, U.S. Geological Survey: \$164,639 awarded.
- 2018-2019 National Park Service; Geologic Mapping of the Guadalupe Mountains and Carlsbad Caverns National Parks; P.I. J. Michael **Timmons**, \$76,582.12 awarded.
- 2018-2019 Regional Induced Seismicity Collaborative (RISC) ; P.I. Mairi Litherland and J. Michael **Timmons**, Bureau of Economic Geology, University of Texas at Austin: \$65,000 awarded.
- 2019 NASA Astronaut Training Exercise in the Flagstaff Area, AZ. P.I. J. Michael **Timmons**,: USRA Houston; \$19,162.
- 2017-2018 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. J. Michael **Timmons**, U.S. Geological Survey: \$161,959 awarded.
- 2018 Sandoval County Oil and Gas Assessment (Phase II), P.I. J. Michael **Timmons** and Ron Broadhead, \$17,794.21 awarded.

- 2018 NASA Astronaut Training Exercise in the BLM Wild Rivers Recreational Area, Taos County, NM. P.I. J. Michael Timmons: USRA Houston; **\$18,060.28.**
- 2017 Geologic Mapping and Hillslope Analysis in Santa Clara Canyon; P.I. J. Michael Timmons: Pueblo of Santa Clara; **\$41,341.81 awarded.**
- 2016-2017 Pajarito Fault Paleoseismic study; P.I. J. Michael Timmons: Lettis Consultants International Inc.; **\$46,254.79 awarded.**
- 2016-2017 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (STATEMAP), Geology of 7.5-minute quadrangles of New Mexico; P.I. J. Michael Timmons, U.S. Geological Survey: **\$161,893 awarded.**
- 2015-2016 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (STATEMAP), Geology of 7.5-minute quadrangles of New Mexico; P.I. J. Michael Timmons, U.S. Geological Survey: **\$154,913 awarded.**
- 2015-2016 USGS Quaternary fault database; P.I. J. Michael Timmons, USGS: **\$20,530 awarded.**
- 2016 Pajarito fault Paleoseismic study; P.I. J. Michael Timmons, Lettis Consultants International Inc.: **\$26,314 awarded.**
- 2015-2016 Source Water Protection Program; P.I. J. Michael Timmons and Stacy Timmons, New Mexico Environment Department: **\$300,000 awarded.**
- 2014-2015 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (STATEMAP), Geology of 7.5-minute quadrangles of New Mexico; P.I. J. Michael Timmons, U.S. Geological Survey: **\$163,068 awarded**
- 2014-2015 Source Water Protection Program; P.I. J. Michael Timmons and Stacy Timmons, New Mexico Environment Department: **\$100,000 awarded.**

- 2013-2014 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. **J. Michael Timmons**, U.S. Geological Survey: **\$153,110 awarded**
- 2013 Geologic Mapping in the Alamosa Canyon area; P.I. J. Michael Timmons, Office of the Sate Engineer: **\$22,387 awarded.**
- 2012-2013 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. **J. Michael Timmons**, U.S. Geological Survey: **\$199,956 awarded.**
- 2012 Geologic Map Compilation of the Alamosa Canyon area; P.I. J. Michael Timmons, Office of the Sate Engineer: **\$21,008.53 awarded**
- 2011-2012 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. **J. Michael Timmons**, U.S. Geological Survey: **\$230,427 awarded.**
- 2010-2011 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. **J. Michael Timmons**, U.S. Geological Survey: **\$226,154 awarded.**
- 2010 Office of the State Engineer, Digital geologic maps of the Alamosa Canyon Area, P.I. **J. Michael Timmons : \$18,577 awarded.**
- 2006-2012 Otero Soil and Water Conservation District: Hydrogeologic Studies, Phase 2, Sacramento Mountains, Otero County, New Mexico, P.I. Peggy Johnson (hydrology \$486,628 awarded) and **J. Michael Timmons** (geologic mapping **\$416,372 awarded**).
- 2008-2011 National Park Service, Phase 2: Geologic maps of the Salinas Pueblo Missions, **P.I. J. Michael Timmons : \$20,978 awarded.**

- 2009-2010 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. **J. Michael Timmons**, U.S. Geological Survey: **\$228,572 awarded.**
- 2008-2009 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. **J. Michael Timmons**, U.S. Geological Survey: **\$223,216 awarded.**
- 2008-2009 Valles Caldera National Preserve, Geologic Map compilation of the Valles Caldera, Jemez Mountains, P.I. **J. Michael Timmons**, **\$10,000 awarded.**
- 2007-2008 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. **J. Michael Timmons**, U.S. Geological Survey: **\$223,800 awarded.**
- 2007-2008 Office of the State Engineer, Digital geologic maps of the Silver City and Ft. Bayard quadrangles, P.I. **J. Michael Timmons** : **\$21,248 awarded.**
- 2007-2008 National Park Service, Phase 1: Geologic map of the western half of the Abo quadrangle, P.I. **J. Michael Timmons** : **\$6,297 awarded.**
- 2007-2008 U.S. Forest Service, Phase IV: Geologic Map compilation of the Valles Caldera area, Jemez Mountains, P.I. **J. Michael Timmons**, **\$11,600 awarded.**
- 2006-2007 National Park Service: Digitize eight geologic quadrangle maps in the vicinity of Bandelier National Monument, P.I. **J. Michael Timmons**, **\$40,000 awarded.**
- 2007 Office of the State Engineer, Geologic Mapping of the Canones and Youngsville quadrangles in the Chama Basin, P.I. **J. Michael Timmons**, **\$5,930 awarded.**

- 2006-2007 U.S. Forest Service, Phase III: Digitize five geologic quadrangle maps in the Santa Fe National Forest, Jemez Mountains, P.I. **J. Michael Timmons, \$10,000 awarded.**
- 2006-2007 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles of New Mexico; P.I. **J. Michael Timmons, U.S. Geological Survey: \$225,025 awarded.**
- 2005-2006 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles in New Mexico; P.I. **J. Michael Timmons, U.S. Geological Survey: \$287,856 awarded.**
- 2004-2005 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles in critical watersheds of New Mexico; P.I. **P.W. Bauer and J. Michael Timmons, U.S. Geological Survey: \$275,275 awarded.**
- 2005 U.S. Forest Service, Phase II: Digitize five geologic quadrangle maps in the Santa Fe National Forest, Jemez Mountains, P.I. **P.W. Bauer and J. Michael Timmons, \$15,120 awarded.**
- 2004 U.S. Forest Service, Phase I: Digitize five geologic quadrangle maps in the Santa Fe National Forest, Jemez Mountains, P.I. **P.W. Bauer and J. Michael Timmons, \$19,400 awarded.**

Total in contracts awarded: \$7,471,098.74

Organization Affiliations:

Geological Society of America
 New Mexico Geological Society
 National Center for Science Education
 Grand Canyon River Guides

Staff Supervision at NMBGMR:

Current staff:

Phil Miller, Coordinator Map Production, October 2011 to present
Bruce Allen, Field Geologist, July 2010 to present
Dan Koning, Field Geologist, July 2010 to present
Matt Zimmerer, Field Geologist II, June 2015 to present
Kevin Hobbs, Field Geologist, May 2020 to present
Snir Attia, Field Geologist, September 2020 to present

Former supervised staff:

Mairi Litherland, Manager NMT Seismological Observatory, March 2018 to Aug 2023
Geoff Rawling, Field Geologist, July 2010 to May 2023
Brian Wheeler, Mechanic II, July 2015 to August 2022
Andrew Jochems, Field Geologist, Aug 2013 to Aug 2019 and Nov 2021 to March 2023
Jacob Thacker, Field Geologist, August 2020 to May 2022
Colin Cikoski, Field Geologist, April 2015 to January 2020
Mark Mansell, GIS Specialist II, July 2010 to 2017
David McCraw, Senior Geological Lab Associate, May 2004 to May 2015
Catherine Nauer, GIS Technician, April 2014 to June 2014
Jennifer Whiteis, GIS Technician, April 2006 to 2008
Shannon Williams, Geologic Lab Associate, July 2008 to June 2011
Akshin Bakytov, GIS Technician, Jan 2010 to March 2010
Kelsey Seals, GIS Technician, March 2010 to January 2014
Sean Connell, Senior Field Geologist, July 2010 to 2012
Shane Ingate, Seismic Lab Associate, February 2016 to July 2018
Elizabeth Roybal, GIS Cartographer, August 2017 to August 2018

Former staff supervision via the Computer Committee

Edward Munsell, Computer Specialist, Jan 2011 to October 2013
Glen Jones, Assistant Director Computers, Jan 2011 to Dec 2013
Adam Read, Webmaster, Jan 2011 to 2015
Nick Tenorio, IT Administrator, March 2014 to 2015

Service on NMBGMR Committees

Equipment Committee, May 2005 to present
Computer Committee, Jan 2010 to present
Executive Committee, July 2010 to present
Tenure Committee Chair for Dan Koning 2012-2015

Member of Geoff Rawling's Tenure Committee 2012-2015
Graduate Student Committee, Erin Lathrop - USU 2016-2017
Tenure Committee for Matt Zimmerer 2018 to 2022
Tenure Committee Chair for Jacob Thacker, 2020 to 2022- left before tenure
Tenure Committee for Kevin Hobbs 2020 to present
Tenure Committee for Snir Attia 2020 to present

Service on NMBGMR Search Committees:

- 2005 Bureau search for graphics specialist – Aquifer Mapping Program – hired Brigitte Felix
- 2007 Bureau search for Hydrogeologist – Aquifer Mapping Program – hired Talon Newton
- 2007 Bureau search for Hydrogeologist – Aquifer Mapping Program – hired Frederick Partey
- 2007 Bureau search for Hydro Lab Associate – Aquifer Mapping Program – hired Trevor Kludt
- 2008 Chaired Bureau search for Geologic Lab Associate - Geologic Mapping Program – hired Shannon Williams
- 2009 Chaired Bureau search for GIS Technician - Geologic Mapping Program – hired Akshin Bakytov
- 2010 Chaired Bureau search for GIS Technician - Geologic Mapping Program – hired Kelsey Seals
- 2011 Bureau search for Director – hired L. Greer Price
- 2011 Chaired search for Coordinator Map Products – Geologic Mapping Program - hired Phil Miller
- 2012 Bureau search for GIS Analyst – hired Hank Yang
- 2013 Chaired search for Field Geologist – Geologic Mapping Program – hired Andrew Jochems
- 2014 Bureau search for IT Administrator – hired Dominic Tenorio
- 2014 Chaired search for GIS Technician – Geologic Mapping Program – hired Catherine Nauer
- 2014 Bureau search for Director of Hydrogeology Programs – Search failed, position filled internally.
- 2015 Bureau search for GIS Technician – Hired Liz Tysor
- 2015 Chaired search for Field Geologist II – Geologic Mapping Program – hired Colin Cikoski
- 2015 Chaired search for Field Geologist II – Geologic Mapping Program – hired Matt Zimmerer
- 2015 Bureau search for Director – hired Matthew Rhoades

- 2016 Chaired search for IT Administrator – hired Dominic Tenorio
- 2017 Search for Manager Publications Program - hired Brigitte Felix
- 2018 Chaired search for Manager NMT Seismological Observatory - hired Mairi Litherland
- 2018 Search for Publications Editor: hired Belinda Harrison
- 2018 Search for GIS Technician/Map Cartographer: hired, Catherine Sauer, Amy Dunn, Kelly Boyd
- 2019 Chair for Petroleum Geologist – Hired Joseph Grigg
- 2019 Chair for Senior Petroleum Geologist – Hired Luke Martin
- 2020 Chair for Surficial Field Geologist – Hired Kevin Hobbs
- 2020 Chair for Bedrock Field Geologist – Hired Jacob Thacker
- 2020 Chair for Bedrock Field Geologist – Hired Snir Attia
- 2022 Chair for Senior Minerologist/Museum Curator – Hired John Rakovan
- 2023 Chair for Geochronologist – Hired Alex Pye

Service to NM Tech Committees and Community:

- New Mexico Tech Presidential Search Committee, June 2023, to present
- New Mexico Tech Strategic Planning - 2027 Vision, Energizing Community Subgroup co-Chair 2020, to present
- New Mexico Tech Strategic Planning Committee, Nov 2013 to March 2015
- Search Committee for Director of P.R.R.C., August 2015 to March 2016
- Science Olympiad Event Supervisor, 2013 to February 2016
- NM Tech Leadership Retreat and Sub-committees, Sept 2017 to present
- NM Bureau of Geology and Mineral Resources Strategic Planning Committee, Oct 2016 to 2017
- Tenure Committee for Ryan Leary 2018-present