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# Quaternary Fault and Fold Database of the United States

**As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the interactive fault map.**

## Nacimiento fault, northern section (Class A) No. 2002a

**Last Review Date: 2015-12-14**

## Compiled in cooperation with the New Mexico Bureau of Geology & Mineral Resources

***citation for this record:*** **Kelson, K.I., Jochems, A.P., and Personius, S.F., compilers, 2015, Fault number 2002a, Nacimiento fault, northern section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 02:23 PM.**

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| **Synopsis** | **General:** The Nacimiento fault is an east-dipping fault bordering the Nacimiento uplift, an 80-km-long, 10- to 16-km-wide uplift related to Laramide deformation. The fault merges with the Gallina fault to the north, and dies out to the south into a broad anticline. The relatively high level of contemporary microseismicity within the Sierra Nacimiento may be related to deformation in the hanging wall of the fault. Detailed mapping along the southern part of the fault shows several short normal faults with both down-to-the-east and down-to-the-west displacements in Quaternary deposits. Down-to-the-east |

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| | displacements may indicate normal reactivation of the Nacimiento reverse fault in the late Quaternary.<br><br>**Sections:** This fault has 2 sections. Woodward (1987 #1130) mapped the Nacimiento and Pajarito faults along the western margin of the Sierra Nacimiento. He noted the lack of continuity between these faults in the vicinity of San Miguel Canyon (section boundary), about 3 km southeast of the village of San Miguel. North of San Miguel Canyon, the fault generally has a lower dip and is a thrust fault, whereas south of San Miguel Canyon the fault is a high-angle reverse fault. Wong and others (1995 #1155) considered potential fault-rupture scenarios that included rupture on either a northern section or a southern section, and on both sections together. These sections are considered separately here. |
| **Name comments** | **General:** The Nacimiento fault extends from Red Mesa, 7 km west of San Ysidro on the south, to the northern end of Sierra Nacimiento, 7 km northeast of Regina. The Nacimiento fault forms the western margin of the Laramide Nacimiento uplift. As used herein, the Nacimiento fault includes the Nacimiento and Pajarito faults of Woodward (1987 #1130), to avoid confusion with the Pajarito fault [2008] along the western margin of the Rio Grande rift near Los Alamos.<br><br>**Section:** This part of the Nacimiento fault was defined as the northern section by Wong and others (1995 #1155). The northern section extends from San Miguel Canyon about 3 km southeast of the village of San Miguel to the northern end of Sierra Nacimiento, 7 km northeast of Regina. |
| **County(s) and State(s)** | RIO ARRIBA COUNTY, NEW MEXICO<br>SANDOVAL COUNTY, NEW MEXICO |
| **Physiographic province(s)** | COLORADO PLATEAUS |
| **Reliability of location** | Good<br>Compiled at 1:24,000 scale.<br><br>*Comments:* Detailed geologic maps at a scale of 1:24,000 are available along the entire fault trace; 1:24,000 maps covering the northern section are those of Woodward and others (1972 #7292; 1973 #7293) and Merrick and Woodward (1982 #7291). These maps are compiled and synthesized by Woodward (1987 #1130). The location of the fault was digitized at 1:24,000 scale using |

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| | photogrammetry to accurately map its trace from these maps. The fault was also mapped by Renick (1931 #1140) at a scale of 1:125,000 and by Wood and Northrop (1946 #1143) at a scale of about 1:95,000. |
| **Geologic setting** | The Nacimiento fault is high-angle and over much of its geologic history a west-vergent reverse fault. The Nacimiento uplift is a north-south elongated structural block that lies west of the Jemez Mountains and forms the eastern margin of the San Juan Basin of the Colorado Plateau. Structural relief of the uplift formed during Laramide deformation, with shortening taking place via folding and reverse movement along the Nacimiento fault. The fault is west of the western margin of the Rio Grande rift. Quaternary normal faulting near Arroyo Peñasco documented by Formento-Trigilio and Pazzaglia (1996 #1295), Formento-Trigilio (1997 #1377), and Formento-Trigilio and Pazzaglia (1998 #2847) may indicate normal reactivation of the Nacimiento reverse fault. The relatively high level of contemporary microseismicity within the Sierra Nacimiento supports the interpretation of Quaternary deformation in the hanging wall of the fault (Wong and others, 1995 #1155; House and Hartse, 1995 #1160). |
| **Length (km)** | This section is 36 km of a total fault length of 82 km. |
| **Average strike** | N3°E (for section) versus N1°W (for whole fault) |
| **Sense of movement** | Normal<br><br>*Comments:* West-vergent thrusting occurred during Laramide deformation. Sense of movement associated with contemporary microseismicity is unknown, but normal backslip may be likely in the present extensional regime. |
| **Dip** | 45°–60° E.<br><br>*Comments:* Bedrock exposures of the fault noted by Woodward (1987 #1130) provide near-surface data on fault dip. Woodward (1987 #1130) speculates that the fault steepens with depth, although there are no published deep structural data for the fault. |
| **Paleoseismology studies** | |
| **Geomorphic expression** | Prominent west-facing range front of the Sierra Nacimiento is coincident with the Nacimiento fault. Baltz (1967 #1167) did not |

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| | find geomorphic evidence of late Quaternary movement. Formento-Trigilio and Pazzaglia (1998 #2847) described low to moderate scarps on middle to late Pleistocene terrace and pediment-fan surfaces along the southern section |
| **Age of faulted surficial deposits** | Youngest faulted bedrock is Cretaceous in age, although there are little or no data on the presence or absence of displaced late Quaternary deposits along the northern section. Manley and others (1987 #1119) map undisplaced Quaternary gravel across the fault trace at Rito de los Pinos, about 10 km northeast of the town of Cuba. |
| **Historic earthquake** | |
| **Most recent prehistoric deformation** | undifferentiated Quaternary (<1.6 Ma)<br><br>*Comments:* Timing of most-recent event on northern section unknown. Prominent geomorphic expression along the range front and possible association with contemporary microseismicity suggest late Quaternary activity (Wong and others, 1995 #1155; House and Hartse, 1995 #1160). |
| **Recurrence interval** | |
| **Slip-rate category** | Less than 0.2 mm/yr<br><br>*Comments:* Low slip-rate category assigned based on the lack of evidence for Quaternary displacement along the northern section. |
| **Date and Compiler(s)** | 2015<br>Keith I. Kelson, William Lettis & Associates, Inc.<br>Andrew P. Jochems, New Mexico Bureau of Geology & Mineral Resources<br>Stephen F. Personius, U.S. Geological Survey |
| **References** | #1167 Baltz, E.H., 1967, Stratigraphy and regional tectonic implications of part of Upper Cretaceous and Tertiary rocks east-central San Juan Basin New Mexico: U.S. Geological Survey Professional Paper 552, 99 p., 1 pl., scale 1:377,000.<br><br>#1377 Formento-Trigilio, M.L., 1997, The tectonic geomorphology and long-term landscape evolution of the southern Sierra Nacimiento, northern New Mexico: Albuquerque, University of New Mexico, unpublished M.S. thesis, 201 p., 1 pl., |

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#1160 House, L., and Hartse, H., 1995, Seismicity and faults in northern New Mexico, *in* Bauer, P.W., Kues, B.S., Dunbar, N.W., Karlstrom, K.E., and Harrison, B., eds., Geology of the Santa Fe region, New Mexico: New Mexico Geological Society, 46th Field Conference, September 27-30, 1995, Guidebook, p. 135–137.

#1119 Manley, K., Scott, G.R., and Wobus, R.A., 1987, Geologic map of the Aztec 1° by 2° quadrangle, northwestern New Mexico and southern Colorado: U.S. Geological Survey Miscellaneous Investigations Map I-1730, 1 sheet, scale 1:250,000.

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#6930 Personius, S.F., Machette, M.N., and Kelson, K.I., 1999, Quaternary faults in the Albuquerque area—An update, *in* Pazzaglia, F.J., and Lucas, S.G., eds., Albuquerque geology: New Mexico Geological Society 50th Annual Field Conference, Guidebook, September 22–25, p. 189–200.

#1140 Renick, B.C., 1931, Geology and ground-water resources of western Sandoval County, New Mexico: U.S. Geological Survey Water-Supply Paper 620, 117 p., 10 pls.

#1155 Wong, I., Kelson, K., Olig, S., Kolbe, T., Hemphill-Haley, M., Bott, J., Green, R., Kanakari, H., Sawyer, J., Silva, W., Stark,

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| | C., Haraden, C., Fenton, C., Unruh, J., Gardner, J., Reneau, S., and House, L., 1995, Seismic hazards evaluation of the Los Alamos National Laboratory: Technical report to Los Alamos National Laboratory, Los Alamos, New Mexico, February 24, 1995, 3 volumes, 12 pls., 16 appen.<br><br>#1143 Wood, G.H., Jr., and Northrop, S.A., 1946, Geology of the Nacimiento Mountains, San Pedro Mountain, and adjacent plateaus in parts of Sandoval and Rio Arriba Counties, New Mexico: U.S. Geological Survey Oil and Gas Investigations Map 57, scale 1:95,000.<br><br>#1130 Woodward, L.A., 1987, Geology and mineral resources of Sierra Nacimiento and vicinity, New Mexico: New Mexico Bureau of Mines and Mineral Resources Memoir 42, 84 p., 1 pl., scale 1:100,000.<br><br>#7293 Woodward, L.A., Anderson, J.B., Kaufman, W.H., and Reed, R.K., 1973, Geologic map and sections of San Pablo quadrangle, New Mexico: New Mexico Bureau of Mines and Mineral Resources Geologic Map 26, scale 1:24,000.<br><br>#7292 Woodward, L.A., McLelland, D., and Kaufman, W.H., 1972, Geologic map of Cuba quadrangle: New Mexico Bureau of Mines and Mineral Resources Geologic Map 25, scale 1:24,000. |