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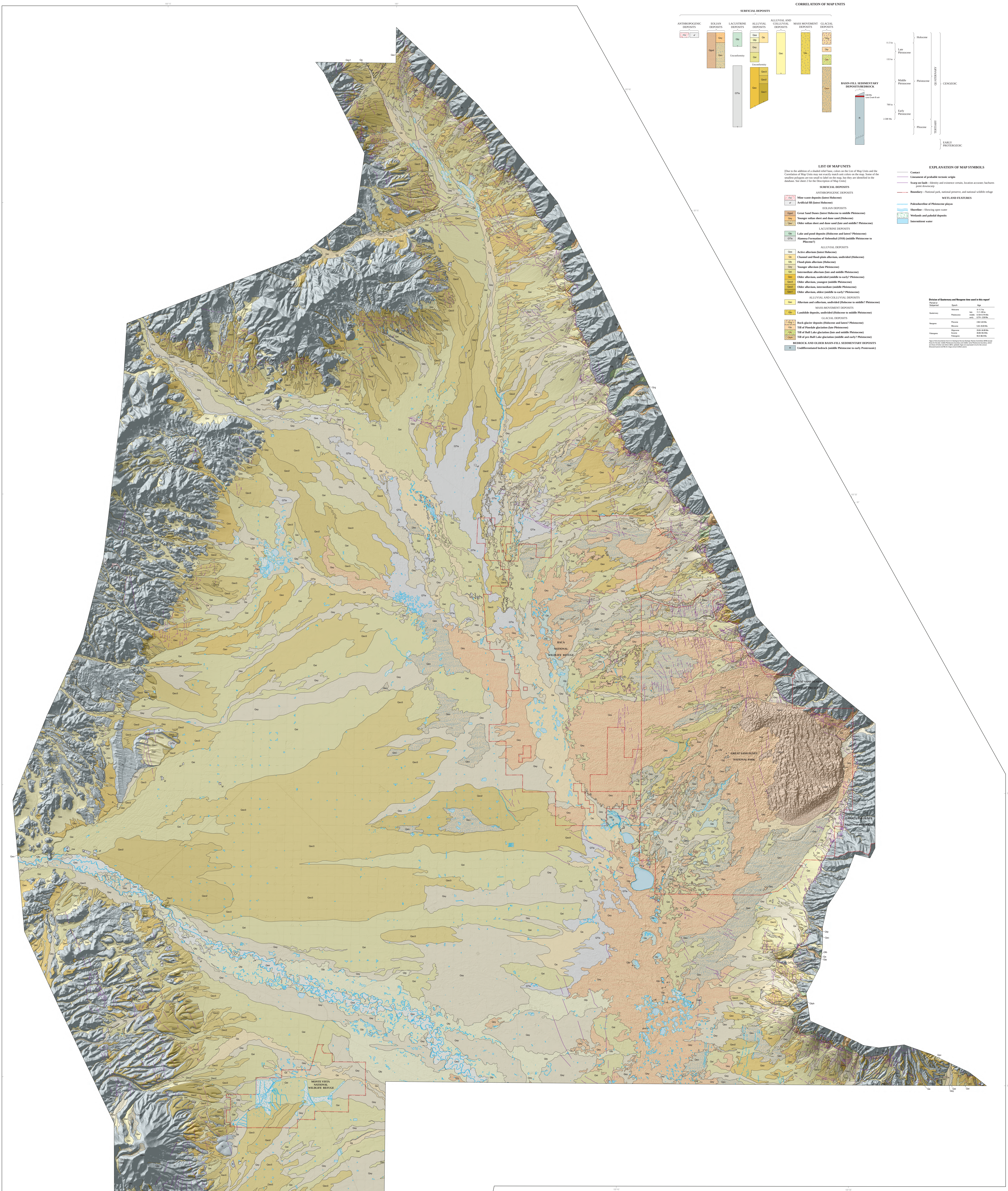
U.S. Department of the Interior
U.S. Geological Survey

Scientific Investigations Map 3475
Sheet 1 of 2


106°15'
106°
105°45'
105°30'
38°15'
38°
37°45'
37°30'
BACA NATIONAL WILDLIFE REFUGE
GREAT SAND DUNES NATIONAL PRESERVE
GREAT SAND DUNES NATIONAL PARK
GREAT SAND DUNES NATIONAL PRESERVE
MONTE VISTA NATIONAL WILDLIFE REFUGE

CORRELATION OF MAP UNITS

SURFICIAL DEPOSITS

ANTHROPOGENIC DEPOSITS: mw, af

EOLIAN DEPOSITS: Qgsd, Qey, Qeo

LACUSTRINE DEPOSITS: Qlp; Unconformity; QTla

ALLUVIAL DEPOSITS: Qaa, Qfp, Qay, Qai, Qa; Unconformity; Qao, Qao3, Qao2, Qao1

ALLUVIAL AND COLLUVIAL DEPOSITS: Qac

MASS MOVEMENT DEPOSITS: Qls

GLACIAL DEPOSITS: Qrg, Qtp, Qtb, Qtpb

BASIN-FILL SEDIMENTARY DEPOSITS/BEDROCK: R

0.63 Ma
Lava Creek B ash

11.5 ka
132 ka
788 ka
2.588 Ma

Holocene; Late Pleistocene; Middle Pleistocene; Early Pleistocene; Pliocene
Pleistocene
QUATERNARY
TERTIARY
CENOZOIC
EARLY PROTEROZOIC

LIST OF MAP UNITS

[Due to the addition of a shaded relief base, colors on the List of Map Units and the Correlation of Map Units may not exactly match unit colors on the map. Some of the smallest polygons are too small to label on the map, but they are identified in the database. See sheet 2 for the Description of Map Units]

SURFICIAL DEPOSITS

ANTHROPOGENIC DEPOSITS

mw	**Mine waste deposits (latest Holocene)**
af	**Artificial fill (latest Holocene)**

EOLIAN DEPOSITS

Qgsd	**Great Sand Dunes (latest Holocene to middle Pleistocene)**
Qey	**Younger eolian sheet and dune sand (Holocene)**
Qeo	**Older eolian sheet and dune sand (late and middle? Pleistocene)**

LACUSTRINE DEPOSITS

Qlp	**Lake and pond deposits (Holocene and latest? Pleistocene)**
QTla	**Alamosa Formation of Siebenthal (1910) (middle Pleistocene to Pliocene?)**

ALLUVIAL DEPOSITS

Qaa	**Active alluvium (latest Holocene)**
Qa	**Channel and flood-plain alluvium, undivided (Holocene)**
Qfp	**Flood-plain alluvium (Holocene)**
Qay	**Younger alluvium (late Pleistocene)**
Qai	**Intermediate alluvium (late and middle Pleistocene)**
Qao	**Older alluvium, undivided (middle to early? Pleistocene)**
Qao3	**Older alluvium, youngest (middle Pleistocene)**
Qao2	**Older alluvium, intermediate (middle Pleistocene)**
Qao1	**Older alluvium, oldest (middle to early? Pleistocene)**

ALLUVIAL AND COLLUVIAL DEPOSITS

Qac	**Alluvium and colluvium, undivided (Holocene to middle? Pleistocene)**

MASS-MOVEMENT DEPOSITS

Qls	**Landslide deposits, undivided (Holocene to middle Pleistocene)**

GLACIAL DEPOSITS

Qrg	**Rock-glacier deposits (Holocene and latest? Pleistocene)**
Qtp	**Till of Pinedale glaciation (late Pleistocene)**
Qtb	**Till of Bull Lake glaciation (late and middle Pleistocene)**
Qtpb	**Till of pre-Bull Lake glaciation (middle and early? Pleistocene)**

BEDROCK AND OLDER BASIN-FILL SEDIMENTARY DEPOSITS

R	**Undifferentiated bedrock (middle Pleistocene to early Proterozoic)**

EXPLANATION OF MAP SYMBOLS

Contact

Lineament of probable tectonic origin

Scarp on fault—Identity and existence certain, location accurate; hachures point downscarp

Boundary—National park, national preserve, and national wildlife refuge

WETLAND FEATURES

Paleoshoreline of Pleistocene playas

Shoreline—Showing open water

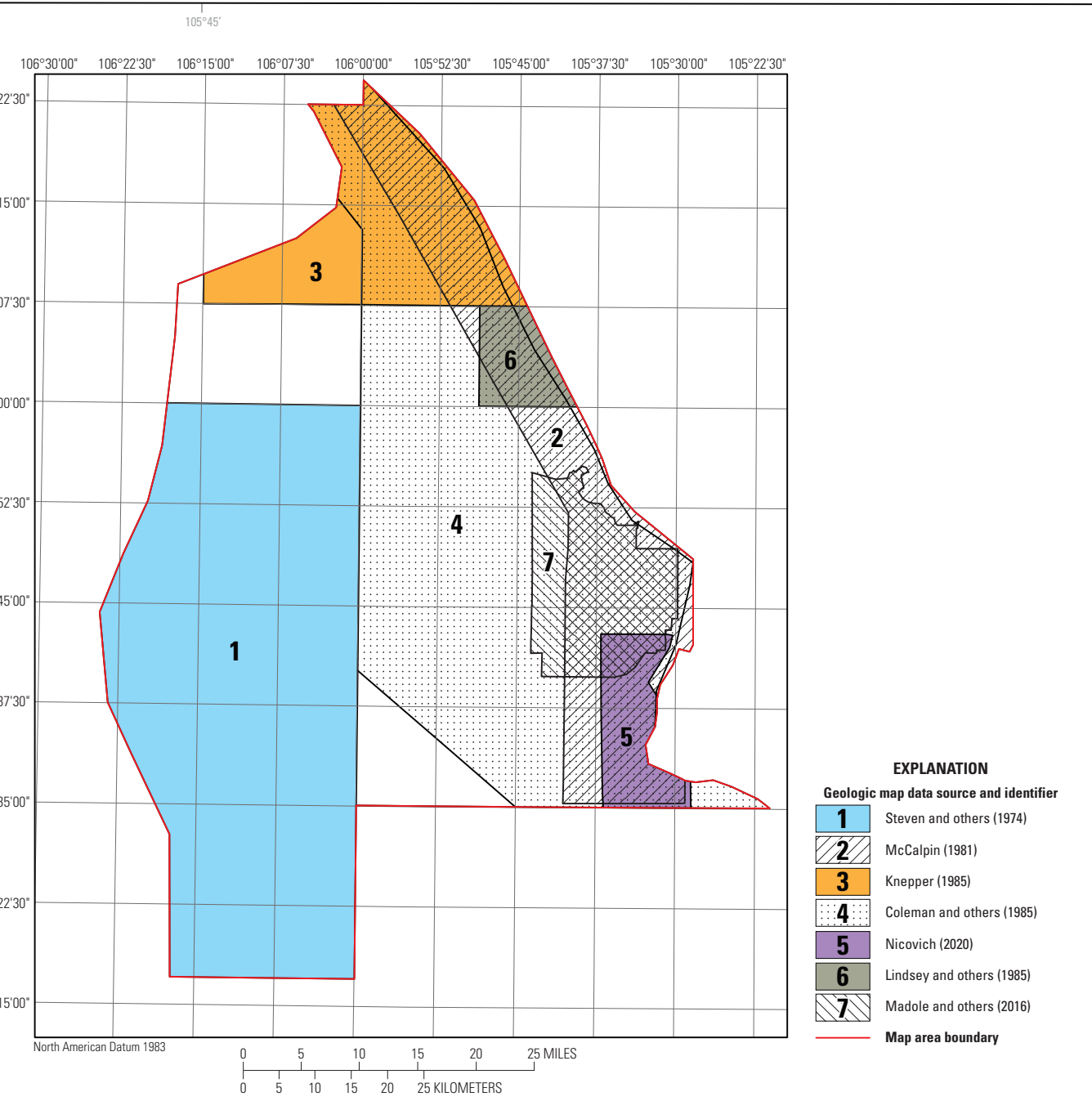
Wetlands and paludal deposits

Intermittent water

Division of Quaternary and Neogene time used in this report[1]

Period or Subperiod	Epoch		Age
Quaternary	Holocene		0–11.7 ka
	Pleistocene	late	11.7–129 ka
		middle	0.129–0.774 Ma
		early	0.774 –2.58 Ma
Neogene	Pliocene		2.58–5.33 Ma
	Miocene		5.33–23.03 Ma
Paleogene	Oligocene		23.03–34.09 Ma
	Eocene		34.09–55.9 Ma
	Paleogene		55.9–66.0 Ma

[1] Ages of time boundaries from U.S. Geological Survey Geologic Names Committee (2018) except those for the late–middle Pleistocene boundary and middle–early Pleistocene boundary, which are those of Cohen and others (2013, updated). Ages are expressed in ka for kilo-annum (thousand years) and Ma for mega-annum (million years).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106°22'30"
106°15'00"
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37°35'00"
37°22'30"
37°15'00"
1
2
3
4
5
6
7
North American Datum 1983
0 5 10 15 20 25 MILES
0 5 10 15 20 25 KILOMETERS
EXPLANATION
Geologic map data source and identifier
1 Steven and others (1974)
2 McCalpin (1981)
3 Knepper (1985)
4 Coleman and others (1985)
5 Nicovich (2020)
6 Lindsey and others (1985)
7 Madole and others (2016)
Map area boundary

Figure 1. Index to geologic map data sources used in map compilation: (1) Steven and others (1974); (2) McCalpin (1981); (3) Knepper (1985); (4) Coleman and others (1985); (5) Nicovich (2020); (6) Lindsey and others (1985); and (7) Madole and others (2016).

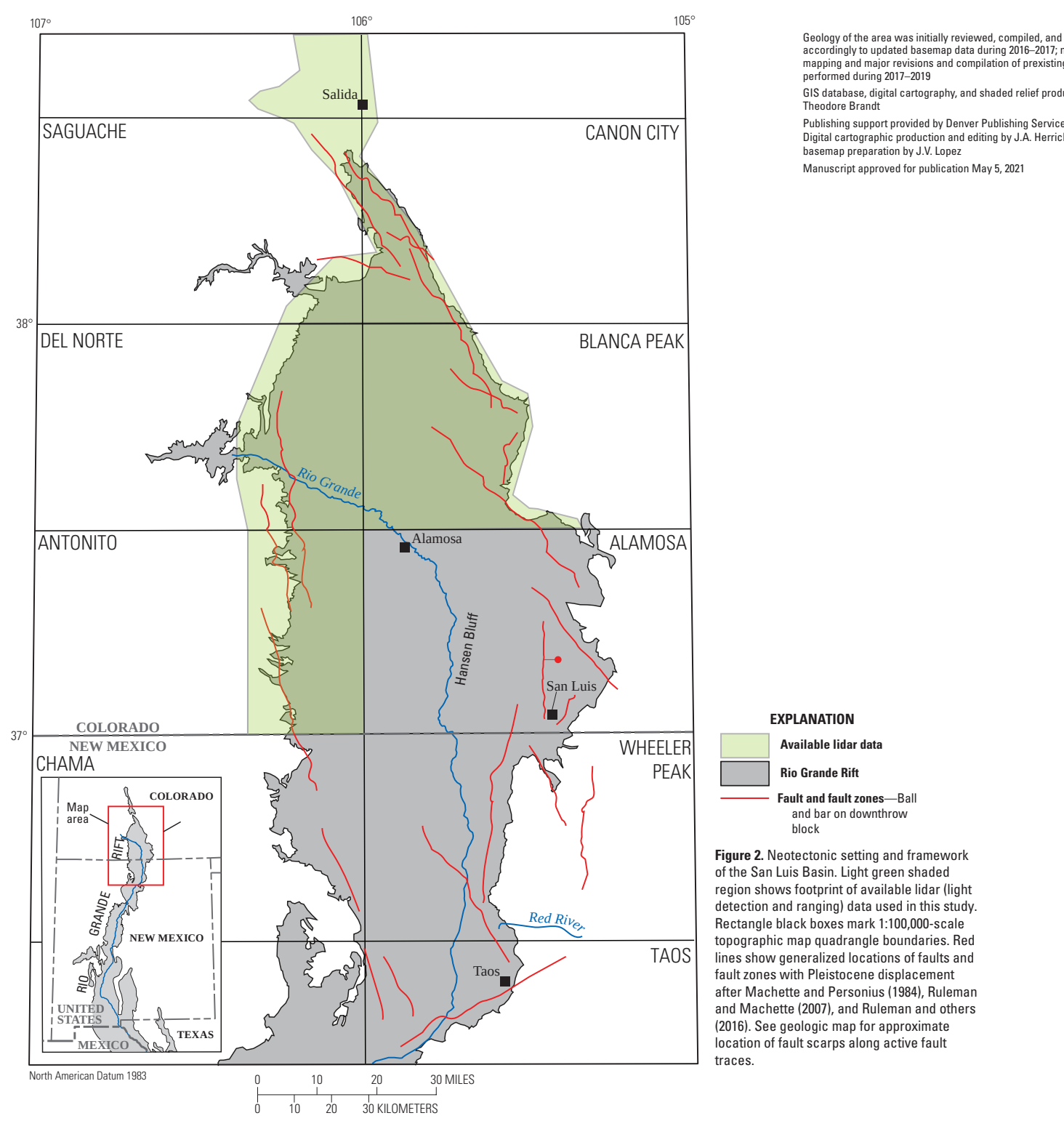
107°
106°
105°
38°
37°
Salida
SAGUACHE
CANON CITY
DEL NORTE
BLANCA PEAK
Rio Grande
ANTONITO
Alamosa
ALAMOSA
Hansen Bluff
San Luis
COLORADO
NEW MEXICO
CHAMA
WHEELER PEAK
Map area
RIO GRANDE RIFT
UNITED STATES
MEXICO
TEXAS
Red River
TAOS
Taos
North American Datum 1983
0 10 20 30 MILES
0 10 20 30 KILOMETERS
EXPLANATION
Available lidar data
Rio Grande Rift
Fault and fault zones—Ball and bar on downthrow block

Figure 2. Neotectonic setting and framework of the San Luis Basin. Light green shaded region shows footprint of available lidar (light detection and ranging) data used in this study. Rectangle black boxes mark 1:100,000-scale topographic map quadrangle boundaries. Red lines show generalized locations of faults and fault zones with Pleistocene displacement after Machette and Personius (1984), Ruleman and Machette (2007), and Ruleman and others (2016). See geologic map for approximate location of fault scarps along active fault traces.

Geology of the area was initially reviewed, compiled, and modified accordingly to updated basemap data during 2016–2017; new geologic mapping and major revisions and compilation of prexisting work was performed during 2017–2019

GIS database, digital cartography, and shaded relief produced by Theodore Brandt

Publishing support provided by Denver Publishing Service Center
Digital cartographic production and editing by J.A. Herrick and basemap preparation by J.V. Lopez

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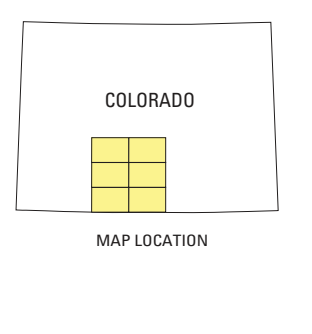
Topographic base from U.S. Geological Survey 1:100,000 scale maps from Alamosa (1983), Antonito (1982), Blanca Peak (1982), Canon City (1982), Del Norte (1982), and Saguache (1985) quadrangles. Additional hydrography from U.S. Geological Survey National Hydrography Database (NHD) (2018)

Shaded-relief base from U.S. Geological Survey's Elevation Products (3DEP), accessed on May 25, 2021, at https://apps.nationalmap.gov/

Universal Transverse Mercator Projection, Zone 13
North American Datum 1983 (NAD 83)

SCALE 1:75 000
1 1/2 0 1 2 3 4 5 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 24000 27000 FEET
1 .5 0 1 2 3 4 5 6 7 KILOMETERS

CONTOUR INTERVAL 50 METERS
SUPPLEMENTARY CONTOUR INTERVAL 10 AND 25 METERS
NATIONAL GEODETIC VERTICAL DATUM OF 1983



MAP LOCATION

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Surficial Geology of the Northern San Luis Valley, Saguache, Fremont, Custer, Alamosa, Rio Grande, Conejos, and Costilla Counties, Colorado

By

Chester A. Ruleman and Theodore R. Brandt

2021

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Digital files available at https://doi.org/10.5066/P9PUTQYK

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