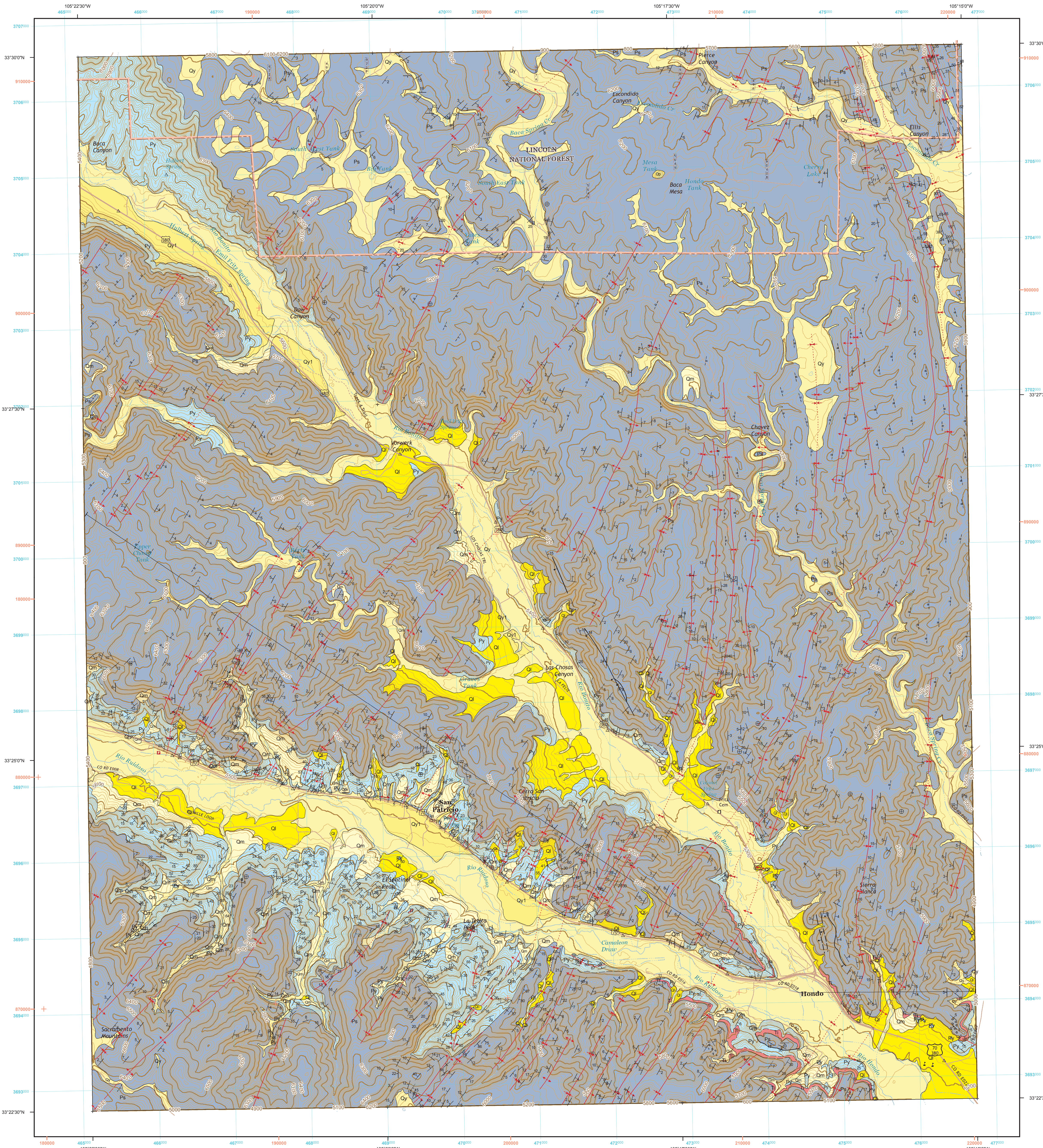
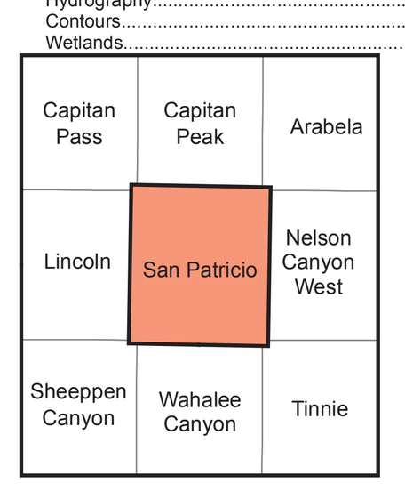
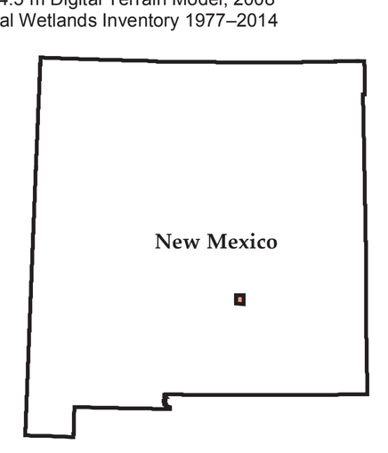


Base map from U.S. Geological Survey 2017.
North American Datum of 1927 (NAD27)
Projection and 1,000-meter grid: Universal Transverse Mercator, Zone 13S, shown in blue.
10,000-foot ticks: New Mexico Coordinate System of 1927 (East zone), shown in red.

Roads.......U.S. Census Bureau, 2015–2016
Names.......GNIS, 2016
Hydrography.......National Hydrography Dataset, 2014
Contours.......IFSAR 4.5 m Digital Terrain Model, 2008
Wetlands.......FWS National Wetlands Inventory 1977–2014





Magnetic Declination
March, 2008
8° 50' East
At Map Center

Quadrangle Location

New Mexico Bureau of Geology and Mineral Resources
New Mexico Tech
801 Leroy Place
Socorro, New Mexico
87801-4796

[575] 835-5490

This and other STATEMAP quadrangles are available for free download in both PDF and ArcGIS formats at:

http://geoinfo.nmt.edu

Digital layout and cartography by the NMBGMR Map Production Group:
Phil L. Miller, Amy L. Dunn, and Katherine J. Sauer

1:24,000

1 0.5 0 1 Mile

1000 0 1000 2000 3000 4000 5000 6000 7000 Feet

1 0.5 0 1 Kilometer

Contour Interval 20 Feet

National Geodetic Vertical Datum 1929

New Mexico Bureau of Geology and Mineral Resources
Open-File Geologic Map 189

Mapping of this quadrangle was funded by a matching-funds grant from the STATEMAP program of the National Cooperative Geologic Mapping Act (Fund Number: ________), administered by the U. S. Geological Survey, and by the New Mexico Bureau of Geology and Mineral Resources, (Dr, Nelia W. Dunbar, *Director and State Geologist*, Dr. J. Michael Timmons, *Assoc. Director for Mapping Programs*).

Geologic Map of the San Patricio 7.5-Minute Quadrangle, Lincoln County, New Mexico

May 2009

by
Steven J. Skotnicki

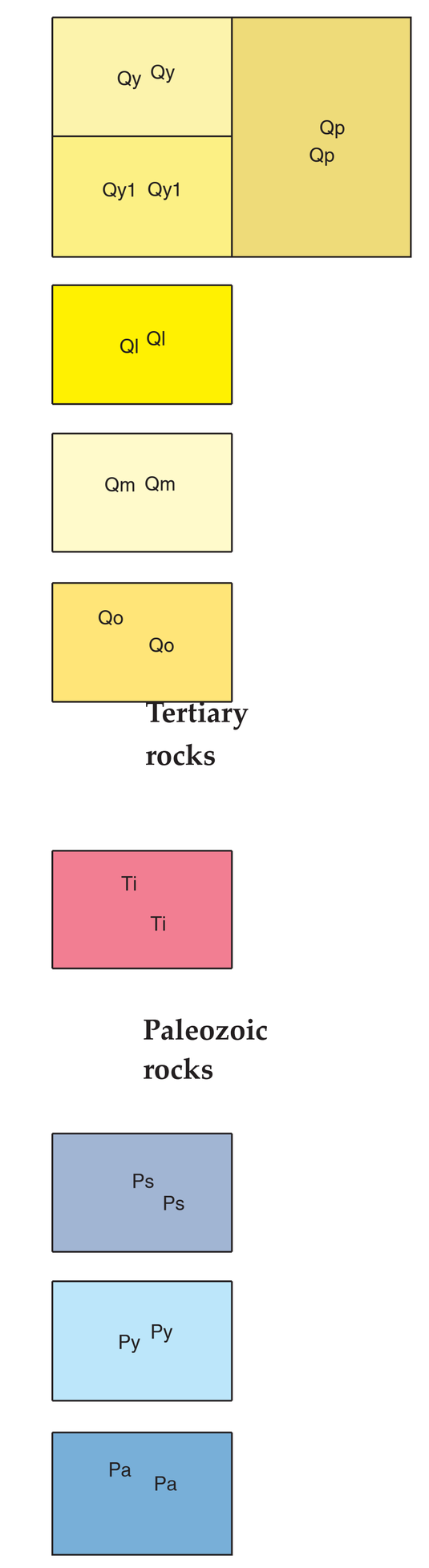
Lawrence Geoservices, 2321 Elizabeth St NE,
Albuquerque, NM, 87112

Comments to Map Users

A geologic map displays information on the distribution, nature, orientation, and age relationships of rock and deposits and the occurrence of structural features. Geologic and fault contacts are irregular surfaces that form boundaries between different types or ages of units. Data depicted on this geologic quadrangle map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation. Locations of contacts are not surveyed, but are plotted by interpretation of the position of a given contact onto a topographic base map; therefore, the accuracy of contact locations depends on the scale of mapping and the interpretation of the geologist(s). Any enlargement of this map could cause misunderstanding in the detail of mapping and may result in erroneous interpretations. Site-specific conditions should be verified by detailed surface mapping or subsurface exploration. Topographic and cultural changes may not be shown due to recent development.

Cross sections are constructed based upon the interpretations of the author made from geologic mapping, and available geophysical, and subsurface (drillhole) data. Cross sections should be used as an aid to understanding the general geologic framework of the map area, and not be the sole source of information for use in locating or designing wells, buildings, roads, or other man-made structures.

The New Mexico Bureau of Geology and Mineral Resources created the Open-file Geologic Map Series to expedite dissemination of these geologic maps and map data to the public as rapidly as possible while allowing for map revision as geologists continued to work in map areas. Each map sheet carries the original date of publication below the map as well as the latest revision date in the upper right corner. In most cases, the original date of publication coincides with the date of the map product delivered to the National Cooperative Geologic Mapping Program (NCGMP) as part of New Mexico's STATEMAP agreement. While maps are produced, maintained, and updated in an ArcGIS geodatabase, at the time of the STATEMAP deliverable, each map goes through cartographic production and internal review prior to uploading to the Internet. Even if additional updates are carried out on the ArcGIS map data files, citations to these maps should reflect this original publication date and the original authors listed. The views and conclusions contained in these map documents are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the State of New Mexico, or the U.S. Government.



Explaination of Map Symbols

31.22 Field station locality

23.9 Collapse structure or sinkhole (too small to draw to scale).

Mile Marker

06.01 Horizontal bedding

06.02 Inclined bedding—Showing strike and dip.

06.03 Vertical bedding—Showing strike.

06.04 Overturned bedding—Showing strike and dip.

06.40 Gently inclined (between 0° and 30°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip.

06.41 Moderately inclined (between 30° and 60°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip.

31.10 Cross section line and label

05.01.01 Anticline (1st option)—Identity and existence are certain. Location is accurate.

05.01.03 Anticline (1st option)—Identity and existence are certain. Location is approximate.

05.01.07 Anticline (1st option)—Identity and existence are certain. Location is concealed.

05.05.01 Syncline (1st option)—Identity and existence are certain. Location is accurate.

05.05.03 Syncline (1st option)—Identity and existence are certain. Location is approximate.

05.05.07 Syncline (1st option)—Identity and existence are certain. Location is concealed.

05.09.01 Monocline (1st option)—Identity and existence are certain. Location is accurate. Arrow shows direction of dip.

05.09.03 Monocline (1st option)—Identity and existence are certain. Location is approximate. Arrow shows direction of dip.

05.09.07 Monocline (1st option)—Identity and existence are certain. Location is concealed. Arrow shows direction of dip.

01.01.01 Contact—Identity and existence are certain. Location is accurate.

01.01.03 Contact—Identity and existence are certain. Location is approximate.

01.01.04 Contact—Identity or existence are questionable. Location is approximate.

01.01.07 Contact—Identity and existence are certain. Location is concealed.

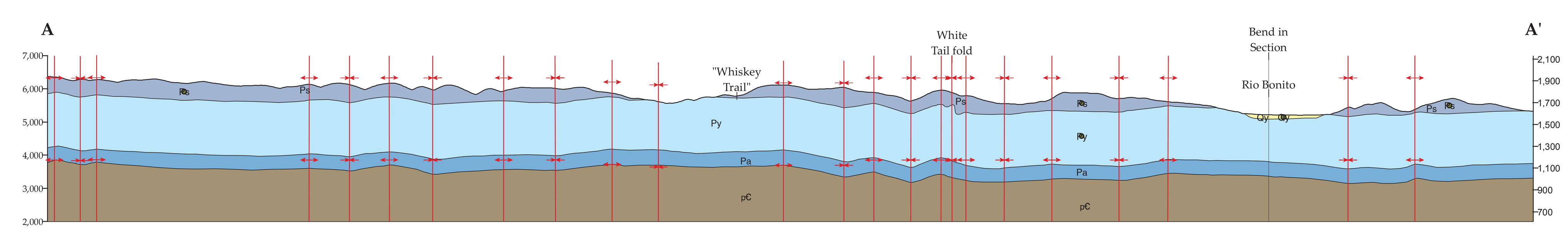
02.01.01 Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence are certain. Location is accurate.

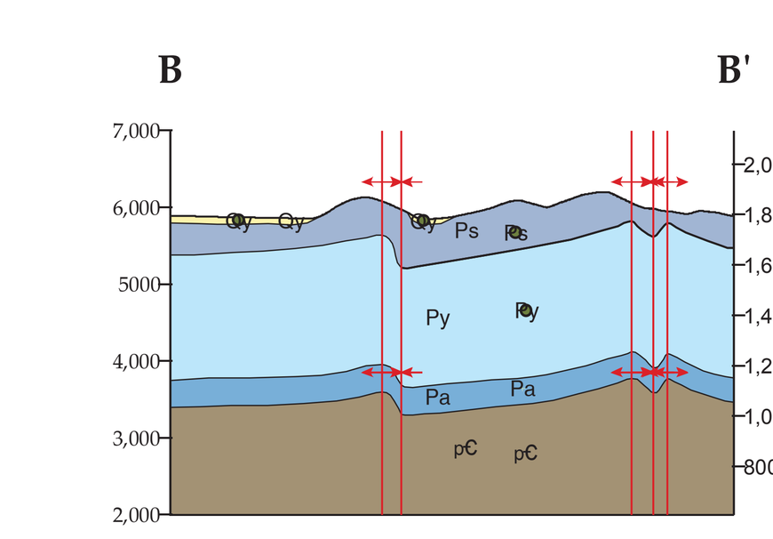
02.02.01 Normal fault—Identity and existence are certain. Location is accurate. Ball and bar on downthrown block.

02.02.03 Normal fault—Identity and existence are certain. Location is approximate. Ball and bar on downthrown block.

02.14.04 Fault-breccia zone or zone of broken rock around fault

31.08 Map neatline





Description of Map

01-01-00-00-00-00—unit—Qy—Holocene alluvial deposits—These deposits were mapped separately from the remainder of the Quaternary surficial deposits because they are relatively easy to identify and are important because these are areas that may be prone to flooding. They are composed of weakly consolidated interbedded gravel, silt, and clay. They commonly form relatively flat deposits at the bottom of the wider drainages. They characteristically contain abundant dark, organic and clay-rich soils at the surface. The deposits are commonly incised up to about 2-3 meters by the modern drainages, where vertical faces locally show older soil horizons. As mapped, this unit locally contains at least two and possibly more terrace levels that might be mappable with larger-scale aerial photos.

01-02-00-00-00-00—unit—Qy1—Holocene alluvial deposits, other member—This subdivision of Qy was mapped separately only in areas along the major rivers where it was obvious that it formed an older deposit higher in the landscape. The Hurd Gallery in San Patricio rests close to the edge of one such terrace where it sits elevated from the lower Qy terrace by about 2-3 meters. Where exposed in road-cuts, these deposits are composed of interbedded silt and gravel. The top surface is mostly covered with fine silt.

01-03-00-00-00-00—unit—Qp—Playa deposits—Mostly weakly consolidated silt and clay. This unit fills two natural depressions in the southeast corner of the Lincoln quadrangle and one in the northeast corner of the San Patricio quadrangle. The depression in the San Patricio quadrangle has the name 'Cherry Tree Lake', according to James McDaniels who lives about two miles to the northwest of the lake.

01-04-00-00-00-00—unit—Ql—Late Pleistocene alluvial deposits—Interbedded silt, fine sand, and gravel. Exposed in some road and stream-cuts not far from the confluence of Rio Ruidoso and Rio Bonito. These deposits contain interbedded silt and locally derived gravel, but are less cemeted than the Qm deposits and typically contain weakly developed pedogenic carbonate horizons. A good exposure is on the north side of Hondo. These deposits form flat constructional surfaces that reside about 20 feet above the Holocene deposits (Qy).

01-05-00-00-00-00—unit—Qm—Middle Pleistocene alluvial deposits—Interbedded silt, fine sand, and gravel. Good exposures are found in the Highway 70 roadcuts which show abundant tan silt interbedded with coarse subangular to subrounded gravel and small boulders. The lower portions hear the large rivers commonly contain rounded river deposits up to about 1-2 meters thick, overlain by silt and carbonate-clast alluvial deposits. Some exposures show multiple soil zones, some of which are moderately cemented by pedogenic carbonate. These deposits form flat constructional surfaces that reside about 40 feet above the Late Pleistocene deposits (Ql).

01-06-00-00-00-00—unit—Qo—Early Pleistocene alluvial deposits—Coarse conglomerate containing clasts up to large boulders 1-2 meters across. Forms a few small rounded dissected remnants in the Lincoln quadrangle. No soil zones remain. Poorly exposed, and typically strongly cemented by calcium carbonate.

02-01-00-00-00-00—unit—Ti—Intrusive rock (Tertiary?)—The textures of all sills in the area are all very similarly fine-to medium-grained. All contain plagioclase, biotite, opaques, and dark stubby minerals that appear to be pyroxene. MacKenzie and others (1992, p.133) described this type of rock as a kersantite, a variety of Lamprophyre (see also Cather et al., 1991). Nearly all of them intrude at or very close to the base of the San Andres Formation and are mostly concordant to bedding. These rocks typically weather into small spheroidal boulders and fine sand. The thickness of these sills is typically from several feet up to about 60 feet, though locally exceeds 150 feet.

03-01-00-00-00-00—unit—=—Precambrian—Cross sections only.

03-01-00-00-00-00—unit—Ps—San Andres Formation (Permian)—Medium-to thick-bedded dolomite and limestone. Dolomite beds are typically light gray-colored, whereas limestone beds are commonly darker gray. Many beds contain sand-sized broken fossil debris surrounded by a matrix composed of micritic and more commonly microspar. Some beds contain faint, parallel laminae parallel to bedding. Other beds are massive and appear bioturbated. Orange-weathering chert is minor but widespread and is composed of granular microcrystalline quartz. The chert commonly forms irregularly shaped masses up to several tens of centimeters across that is both discordant and concordant to bedding. Common larger fossils include coiled gastropods up to about 5 cm across and less abundant nautiloids up to about 10 cm. Smaller recognizable fossils include crinoid stem segments, disarticulated brachiopods (commonly up to 2 cm and replaced by chert), and sparse fussilinids. The carbonate beds are interbedded with well sorted, fine- to medium-grained quartz sandstone from 1-10 meters thick, which probably represent intertonguing Glorietta Sandstone. The sandstone beds occur throughout the interval of the San Andres Formation, but are most common and thicker in within a few hundred feet of the base. Sandstone beds typically weather light orange to brown and in most outcrops contain abundant calcite-cemented BB-size concretions up to 2-3 mm across. Maximum thickness in cross-section is about 800 feet.

03-02-00-00-00-00—unit—Py—Yeso Formation (Permian)—Interbedded fine-grained quartz sandstone, siltstone, dolomite, and bedded gypsum. Siltstone is commonly rusty red and pale yellow. Dolomite beds are locally fossiliferous and contain silicified brachiopod and crinoid fragments, abundant coiled gastropods, aminods, and possibly cephalopods. Dolomite beds locally contain moldic porosity with some pores still filled with gypsum. Gypsum beds are typically sub-horizontally banded and are locally thicker than 10 meters. Exposures are poor and typically mantled by regolith. The thickness obtained from the log of the Muñoz Canyon AAN Fed. No.1 well is 1,685 feet.

03-03-00-00-00-00—unit—Pa—Abo Formation (Permian)—Shown only in the cross-sections. The thickness obtained from the log of the Muñoz Canyon AAN Fed. No.1 well is 370 feet.