

Geologic Map of the Nogal Quadrangle, Lincoln County, New Mexico

By

Geoff Rawling

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Open-file Digital Geologic Map OF-GM 195

Scale 1:24,000

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

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Mapped and compiled by Geoffrey Rawling

EXPLANATION OF MAP UNITS

Anthropogenic Deposits

af Artificial fill for stock tanks and highway embankments.

Quaternary and Tertiary Surficial Deposits

QHa Alluvium (Holocene to Historic) – Unlithified gravel and poorly to moderately sorted clay, silt, sand in active stream channels and ephemeral arroyos. Generally incised into **Qvf** and terrace deposits. Only mapped where extensive; unit is otherwise lumped with **Qvf**. Thickness: 0 to 4 (?) meters.

Qvf Valley fill (upper Pleistocene to Holocene) - Unlithified valley fill composed of poorly sorted clay, silt, and sand, commonly with angular to subrounded cobbles of local bedrock. Matrix material is light to dark brown. Grades into minor alluvial and colluvial fans on toes of hillslopes. Anthropogenic disturbance common in developed

areas. Generally incised by active drainages, floored by sand and cobble to boulder gravel of **QH_a**. Thickness: 0 to 6 (?) meters

Qaf – Alluvial fan deposits (middle to upper Pleistocene) – Alluvial fans composed of poorly sorted cobbles, boulders, sand, silt, and clay. Fans head in short, steep tributary canyons and interfinger with and/or spread out onto Qvf and underlying bedrock. Stabilized by vegetation and apparently no longer active, and locally incised by drainages floored with **QH_a**. They flank the steep slopes of Vera Cruz and Church Mountains. Thickness: 0 to 15 (?) meters.

Qbt – Bajada and fan toe deposits (middle to upper Pleistocene) - Low gradient, coalesced fan deposits at the base of large alluvial fans shed from Vera Cruz and Church Mountains. Contacts identified on aerial photographs. Similar in composition to adjacent alluvial fans. Thickness: 0 to 10 (?) meters.

QTg – Pediment gravel deposits (Pliocene to lower Pleistocene (?)) – Well lithified, moderately well-bedded pebble to boulder gravel with strong carbonate cement. Clasts are Sierra Blanca volcanic rocks and associated intrusive igneous rocks. Poor exposure other than in roadcuts on Highway 37 and extensive downslope colluvium makes base of unit hard to identify. Deposited by steep gradient streams draining the Sierra Blanca, predating incision of modern drainages. Unit is tentatively correlated with mesa-capping gravels in the Capitan, Fort Stanton, and Angus quadrangles to the east. Thickness: 0 to 30 (?) meters.

Cenozoic Igneous Rocks

Tiu – undetermined igneous rocks, undivided (Oligocene) – comprises dikes identified on aerial photos, probably largely Tdd, the most common dike rock observed in the field.

Tdd – Diabase/diorite and associated rocks, undivided (Oligocene) – Aphanitic to very fine-grained phaneritic and phaneritic-porphyritic mafic igneous rocks forming dikes, sills, and less commonly, irregular intrusive masses. Generally light to dark dark gray on fresh surfaces and brown to black on weathered surfaces. When phaneritic, often has a “salt and pepper” appearance due to fine-grained equigranular white feldspar and black to brown augite (?). Phenocrysts include augite, hornblende, and tabular intermediate (?) plagioclase. Tabular plagioclase phenocrysts are up to 4 cm in diameter and are usually aligned with the dike margins. Thickness: dikes are < 1 to 5 meters wide.

Tml – Monzonite/latite and associated rocks (Oligocene) – Tan to brown aphanitic to very fine-grained phaneritic igneous rocks forming dikes, sills and irregular intrusive masses. Typically composed of approximately equal amounts of white feldspar and tan to brown mafic minerals with little or no quartz. Feldspar is largely intermediate (?) plagioclase with lesser amounts of potassium feldspar and forms a felted network of interlocking crystals. Includes rocks ranging from syenite to diorite in composition. Thickness: dikes are < 1 to 5 meters wide; base and top of larger igneous masses are not exposed.

Tcd – Diorite of Champ Hill (Oligocene) - Dark gray to grayish-brown fine-grained phaneritic diorite with 10-35% phenocrysts of augite up to several centimeters across. Named for Champ Hill, a stock in the Angus quadrangle to the southwest. Rocks of similar appearance but varying phenocrysts percentage form dikes, sills, and irregular intrusive masses. Thickness: dikes are < 1 to 5 meters; base and top of larger igneous masses are not exposed.

Tmz – Monzonite (Oligocene) - Medium to fine-grained monzonite. Composed of approximately equal amounts of white feldspar and tan to brown mafic minerals with little or no quartz. Similar in color and composition to Tml, but coarser-grained. . Present mostly as irregular discordant intrusions, often associated with faults, and less commonly as dikes. Thickness: up to several tens of meters, base and top of irregular igneous masses are not exposed.

Trt – Rhyolite/Trachyte and associated rocks (Oligocene) – White to pale orange, aphanitic and usually aphyric igneous rocks forming dikes, sills and irregular igneous masses, often associated with faults. Where present phenocrysts are limited to quartz, usually less than 10%. Liesegang bands, flow-banding, and vesicles are common. Thickness: dikes are < 1 to 5 meters; base and top of larger igneous masses are not exposed.

Tvci – Vera Cruz Mountain intrusion – (Oligocene) – Complex felsic intrusion, probably a laccolith, underlying Vera Cruz Mountain. Composed of a core of biotite-phyric granite surround by aphyric rhyolite and/or trachyte and quartz-phyric rhyolite. Finer-grained rocks extend away from the main intrusion as sills and dikes. Thickness: base is not exposed; several hundred meters are exposed along mountain flanks.

Tsv – Sierra Blanca volcanic rocks (upper Eocene to Oligocene) - Walker andesite breccia of Thompson (1972). Interbedded dark purple, purplish-red, red, and light to dark gray and gray –green volcanic flow breccias, volcanic debris flows, shallow intrusive sills, lahars, and volcanoclastic sedimentary rocks from the Sierra Blanca volcanic center. Rocks are generally alkalic and range from mafic (tephrite, phonotephrite, trachybasalt) to intermediate (andesite and latite) to felsic (rhyolite, trachyte, phonolite) in composition. Flow breccias are dominant and consist of varicolored angular to subrounded clasts of volcanic and lesser intrusive rocks in a purple or purplish-gray fine-grained matrix. Matrix is often propylitically altered. Clast population may be monolithologic or varied. Outcrops are massive to crudely bedded and individual flow units are generally 2 to 3 meters thick. Shallow intrusive sills are light to dark gray and aphanitic. Lahar deposits and volcanoclastic sedimentary rocks are red to purple muddy sandstones to conglomerates with variably developed bedding and sorting. Sandstones are well-bedded, often with fining-upward graded beds less than 0.5 cm thick. Natural exposures of all units are poor

and individual units are not laterally traceable. Thickness: at least 300 meters are meters are exposed in the quadrangle.

Cenozoic Sedimentary Rocks

Tcm - Cub Mountain Formation (Eocene) – White to tan sandstones, dark red sandy mudstones, and purplish-red silty mudstones. Sandstones are medium- to thick-bedded, cross-bedded, medium-grained, and arkosic to volcaniclastic. Pebble conglomerate lenses, mudballs, and ripup clasts of red mudstone, and olive, black, and gray siltstone and shale are locally common. Sandstones are more friable, and contain more varicolored lithic grains than than underlying sandstones of the Cretaceous Crevasse Canyon Formation. Sandy and silty mudstones are thick-bedded to massive and micaceous. Unit is ubiquitously intruded by igneous dikes, sills and irregular masses. Thickness: At least 150 meters; unit probably thickens greatly to the west towards the center of the Sierra Blanca Basin.

Mesozoic Sedimentary Rocks

Kcc – Crevasse Canyon Formation (upper Cretaceous) – Interbedded olive drab to gray to buff medium- to fine-grained sandstone, gray to black fissile carbonaceous shale, and coal. Unit is ubiquitously intruded by dikes, sill, and irregular igneous masses. Thickness: ~ 250 meters based on cross-section A-A' in the Capitan quadrangle; this estimate is probably high to due to numerous dikes and unmapped faults.

Kgs – Gallup Sandstone (upper Cretaceous) – Pale lavender to pale gray to tan, medium- to very thick-bedded, trough cross-bedded, clean quartz sandstone and minor chert and quartzite pebble conglomerate. Sandstones are noncalcareous and composed of moderately sorted subangular to subrounded quartz grains with 1-2% chert grains. Four major sandstone beds are present, separated by recessively weathering sandstones and minor shales that are poorly exposed. The unit forms prominent cliffs and ridges. Thickness: ~ 75 meters.

Km - Mancos Shale (middle to upper Cretaceous) - Black to purplish gray laminated fissile shale. Black to dark gray to olive thin-bedded fine-grained sandstone and siltstone beds less than 0.5 meters thick are minor constituents. Igneous intrusions are common. Generally only well exposed in stream cuts and manmade excavations. Thickness: ~ 215 meters.

Kd - Dakota Sandstone (lower to middle Cretaceous) - cross-section only

TrJsm - Morrison Formation (Jurassic) and San Pedro Arroyo Formation (upper Triassic), undivided – cross-section only