GEOLOGIC MAP OF PARTS OF THE LUKEVILLE, DIAZ PEAK, SOUTH OF LUKEVILLE AND BLANKENSHIP WELLS 7 ½' QUADRANGLES, ORGAN PIPE CACTUS NATIONAL MONUMENT, PIMA COUNTY, ARIZONA

Arizona Geological Survey Digital Geologic Map DGM-74

By

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Youberg, A., and Pearthree, P.A., 2012, Geologic map of Parts of the Lukeville, Diaz Peak, South of Lukeville and Blankenship Wells 7 ½' Quadrangles, Organ Pipe Cactus National Monument, Pima County, Arizona : Arizona Geological Survey Digital Geologic Map DGM-72, version 1.0, scale 1:24,000.

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Introduction

This geologic map covers the western two-thirds of the Sonoyta Valley, the eastern flanks of the Sonoyta and Puerto Blanco Mountains, and the southern flanks of the Diablo Mountain within Organ Pipe Cactus National Monument in southwestern Arizona. Many of the drainages in the eastern half of the map area originate in the Ajo Mountains to the northeast and east. The map depicts the late Cenozoic surficial deposits in the valleys and the middle Cenozoic volcanic rocks exposed mainly in the mountains along the edges of the map, and in small unnamed hills throughout the map area. Production of this new geologic map is the product of a cooperative research agreement between the National Park Service and the Arizona Geological Survey, and was funded primarily by the National Park Service. All surficial geologic mapping is new for this project. Bedrock geology is modified from Skinner et al (2008). Mapping was compiled digitally using ESRI ArcGIS software, over a high-resolution (30 cm) digital orthophoto base (Organ Pipe National Monument, 2008), and 10 m and 3 m digital elevation models (USGS Seamless Data Warehouse).

Organ Pipe Cactus National Monument is located in the Basin and Range Province of southwestern Arizona, on the U.S. – Mexico border. Most of the area covered by this map is underlain by late Cenozoic, valley-filling clastic sedimentary deposits that are as much as 800 feet thick in the the Sonoyta Valley (Richard et al., 2007). These consist mostly of sandstone and conglomerate in alluvial fans near the mountains and fine-grained deposits toward the Rio Sonoita valley axis. Sonoyta Valley is covered by relatively thin surficial deposits ranging in age from late Pliocene to modern. Moderately to deeply incised drainages in Sonoyta Valley flow south to the Rio Sonoita in Mexico. In general, upper piedmont areas are dominated by moderately coarse, incised Pleistocene alluvial fan deposits; young, relatively fine-grained deposits from unincised, active washes are prevalent on the lower piedmonts near the international border with Mexico. In these areas, this geologic map indicates areas of potential flood hazards due to widespread sheetflooding.

Bedrock of the map area is dominated by suites of Miocene volcanics and associated volcaniclastic rocks, with limited exposures of Cretaceous granitic rocks. Miocene volcanics were erupted as part of the Oligo-Miocene volcanism that swept across Arizona from east to west, and are predominantly felsic to intermediate lavas, dikes and pyroclastic rocks with associated breccia and conglomerate. These units are faulted and moderately tilted. The youngest volcanic rocks in the map area are basaltic andesites capping small hills along the northern boundary of the map area. Resistant layers within several of the volcanic units form the prominent cliffs of the Diablo Mountains, but much more erodible volcanic units are also widespread in the mountain and adjacent hills and ridges. These erodible units commonly are covered by colluvium or talus derived from upslope, or in situ weathered regolith.

References

Richard, S.M., Shipman, T.C., Greene, L.C., and Harris, R.C., 2007, Estimated Depth to Bedrock in Arizona, v 1.0: Arizona Geological Survey Digital Geologic Map DGM 92, 9 p. text, scale 1:1,000,000.

Skinner, L.A., Haxel, G., and Umhoefer, P.J., 2008, Geological Reconnaissance at Organ Pipe Cactus National Monument, Arizona: Northern Arizona University, Unpublished Digital Data, 1:24000 scale. (NPS GRI Source Map 75008)

Map Unit Descriptions

Surficial Deposits

Qyc **Active channel deposits** - Deposits in active, open channels of washes that are large enough to depict at the map scale. This unit is composed of moderately-sorted sand and silt, with common pebbles and some cobbles in the lower piedmont areas, to poorly-sorted sand, pebbles, cobbles and boulders in the upper piedmont areas. Channels are incised less than 2 m below adjacent late Holocene terraces and alluvial fans. Channel morphologies generally consist of a single-thread, deep, high-flow channel or multi-threaded, shallow, low-flow channels with adjacent gravel bars. There is no soil development in these deposits.

Qyx **Areas of active arroyo formation** - Meter-scale, entrenched, ephemeral streams with vertical walls, hanging valleys and small inset terraces occurring in in fine-grained units such as Qy1 and Qys. Arroyo developement may be related to land-use practices that alter vegetation coverage, sediment accumulation, and compaction.

Qyr **Smaller active channels, bars, and low terraces** - Deposits associated with active channels, and bars and low terraces along washes and adjacent, recently active sheetflood areas. In upper piedmont areas, channel sediment is generally poorly-sorted to very poorly-sorted sand and pebbles, but may include cobbles and boulders. Terrace surfaces commonly are mantled with silt, sand, and gravel. On lower piedmont areas, young deposits consist predominantly of moderately-sorted silt, sand, and fine gravel, including some pebbles and cobbles in channels. Channels typically are incised less than 1 m below adjacent terraces and fans, but locally incision may be as much as 2 m. Channel morphologies generally consist of a single, moderately deep high-flow channel or multi-threaded, shallow, low-flow channels with adjacent gravel bars and finer floodplain deposits. Terraces and sheetflood areas commonly have planar to gently undulating surfaces and are covered primarily with fine-grained deposits with minor gravel concentrations. Soil development is minimal.

Qys **Young sheetflood deposits** - Laterally extensive sand and silt with minor fine gravel and clay deposits. Soil development is weak to none. Channels or swales are small, unincised or minimally incised, and discontinuous. Vegetation consists of creosote and other small bushes, with some small trees locally along swales.

Qy1 **Low terrace deposits** - Young deposits found on floodplains and low terraces adjacent to active channels, or drainageways that receive occasional inundation. On middle and lower piedmonts, deposits typically consist of sand, silt, and clay, with local channel gravel deposits. On upper piedmonts, deposits typically consist of sand to small boulders capped with sand and finer deposits on terraces and other areas subject to overbank flooding. Qy2 surfaces are gently undulating where fine-grained, but have up to 1 m of local topography between gravel bars and adjacent, finer-grained swales. Surfaces typically are light brown to gray in color, and surface gravel has very weak to no desert varnish. Soil development associated with Qy2 deposits is weak with no clay accumulation and minimal to stage I carbonate accumulation.

Qy1 **Terrace and alluvial fan deposits** - **Terrace and alluvial fan deposits** with weak but evident soil development. Qy1 deposits are generally poorly sorted sand, pebbles, cobbles, silt and boulders. Qy1 surfaces are typically 0.5 to 3 m higher than adjacent younger surfaces. Qy1 surfaces are generally planar where fine-grained, but undulate between coarse gravel bars and adjacent swales in the middle and upper piedmont, with local surface relief up to 1 m. Surfaces typically are covered with lightly varnished gravel lag to loose, weakly varnished desert pavement, especially in swales. In lower piedmont areas, Qy1 surfaces typically are mantled with a loose to moderately packed, moderately varnished pebble lag. Surface color is brown to slightly reddened (10 to 7.5 YR), and is darker than fresh fluvial deposits of younger units. Carbonate is present throughout the soil profile, but in some exposures gravel coatings are thin but continuous at about 0.5 m depth (stage II).

Qyd **Young debris-flow deposits** - Coarse, very poorly sorted deposits on steep hillslopes and along some washes within and near the mountains. Deposits consist primarily of small to medium boulders, cobbles, pebbles and sand. Typically, the coarse deposits form linear levees paralleling small washes or irregularly shaped piles representing debris flow snouts. Surface boulders and cobbles have minimal to moderate rock varnish suggesting deposit ages of Holocene to latest Pleistocene. This unit also includes areas of erosion (debris flow scars) on hillslopes that are spatially associated with debris flow deposits. Multiple debris flows on the north and west sides of Diaz Peak just east of the map area were initiated during a 2006 monsoon storm, attesting that debris-flow processes are active in the mountains of Organ Pipe National Monument.

Qiy **Younger intermediate alluvial fan and terrace deposits** - Weakly to moderately dissected alluvial fan and terrace deposits with moderate soil and desert pavement development. Deposits consist of poorly sorted cobbles, pebbles, and sand, with lesser amounts of silt, clay and boulders. Qi3 surfaces typically are planar but relict gravel bars are evident and stand slighthy higher than surrounding surfaces. Surfaces commonly are covered with loose to moderately-packed desert pavements with weak to moderate varnish. Soils are slighlty reddened (7.5YR) but clay accumulation is minimal (cambic horizons); underlying calcic horizons include thin to moderately thick, discontinuous to continuous carbonate coatings on gravel and soft carbonate nodules (stage II to III). Some Qi3 soils are not reddened and may represent a somewhat younger set of deposits that were not mapped separately. Qi3 surfaces are generally less than a few meters above active channels, but near the mountains may be as much as 10 m higher than active channels.

Qii **Intermediate alluvial fan deposits** - Moderately dissected alluvial fan and terrace deposits with moderate to strong soil development and strong but variable desert pavement development. Deposits typically consist of poorly sorted cobbles, pebbles, and sand, with lesser amounts of silt, clay and small to medium boulders. Well-preserved planar Qi2 surfaces typically have well-varnished, tight pebble and cobble pavements, although areas without desert pavements are common. Surface carbonate fragments from underlying soil horizons are uncommon. Soils are reddish brown to brown (5 to 7.5YR), with obvious clay accumulation in strong cambic or weak argillic horizons up to 0.5 m thick. Calcic horizon development ranges from carbonate nodules, thick gravel coatings (stage III), and weakly cemented petrocalcic horizons with incipient laminar horizons (stage IV). Near the mountains Qi2 deposits are dominated by cobbles and boulders, and surfaces may be up to 5 m above active channels. On the lower piedmont, deposits are sandy with substantial gravel, locally including small boulders, and surfaces are typically less than 2 m above active channels.

Qi1 **Older intermediate alluvial fan deposits** - Moderately to deeply dissected relict alluvial fans with strong calcic horizon development. Deposits are poorly sorted, containing cobbles, pebbles, sand and boulders with minor silt and clay. Landforms are moderately to deeply eroded, and typically form gently rounded ridges with relatively limited planar remnants approximating the original fan surface. Carbonate fragments derived from underlying petrocalcic horizons are common on surfaces, giving them a light color on the ground and on aerial photographs. Active channels are incised up to 10 m below these surfaces. Soils are brown to yellowish red (7.5 to 5YR), with weakly to moderately cemented petrocalcic horizon development and some laminar carbonate (stage IV to V).

Qo **Old alluvial fan deposits** - High-standing, moderately to deeply dissected relict alluvial fans with strong but variable calcic horizon development. Qo fan surfaces are preserved only near the mountains. Deposits are very poorly to poorly sorted gravel and sand. Some surface cobbles and boulders are darkly varnished, but varnish is variable due to rock weathering. Fragments from underlying petrocalcic horizons are common, giving the surface a very light color on the ground and on aerial photographs. Soils substantially eroded but are very calcareous with cemented petrocalcic horizons and laminar carbonate layers are exposed at the surface in some areas (stage IV to V).

Tsy **Very old alluvial fan deposits** - Weakly to moderately indurated, interbedded conglomerate and sandstone, and very poorly sorted, weakly bedded conglomerates and breccias. Deposits are very calcareous and are cemented by calcium carbonate and possibly silica. The color of this unit typically is grayish or reddish, depending on clast lithologies. This unit is exposed primarily in or near the mountains, but is also exposed beneath thin surficial deposits at many localities in the middle and upper piedmont.

Tsf **Fine-grained alluvial fan and basin fill deposits** - Tsf is found in the distal piedmont areas of the Lukeville map sheet. Tsf is composed of eroded ridges or preserved remnants underlying Qi1 in the southern and central area of the map. The eroded ridges and hillslopes are covered by moderately to tightely packed gravel-cobble lag. Underlying sediments are composed of light brown (7.5YR 6/3), calcareous silt to gravelly silt. This unit is likely finer-grained deposits assiocated with unit Tsy.

Bedrock

Tba **Batamote Andesite Complex - Basaltic andesite flows and flow breccias** - Porphyritic, medium-gray to black basaltic andesite with reddish, oxidized flow margins.

Tmr **Rhyolite of Montezuma's Head - Rhyolite, rhyodacite, and minor dacite** - Rhyolite, rhyodacite, and minor dacite flows, flow breccias, and plugs

Tmt **Rhyolite of Montezuma's Head - Tuff and tuff breccia** - Buff, yellow, greenish, and white crystal-vitric and lithic-lapilli tuff, tuff-breccia, agglomerate, and tuffaceous sandstone.

Tmd **Rhyolite of Montezuma's Head - Dacite of the Ajo Range** - Brown, gray, and black porphyritic dacite flows interbedded with rhyolite (Tmr); locally includes sparse yellow tuff-breccia (Tmt).

Tdc **Daniels Conglomerate and associated lake deposits** - Tan, gray, or red, poorly-indurated, shallow-dipping, pebbly to sandy conglomerate, subordinate sandstone and pebbly sandstone.

Tdu **Dacite, undivided** - Reddish-brown, dacitic lava flows and densely welded ash-flow-tuff; phenocrysts include biotite and plagioclase and the unit locally contains abundant flattened pumice lapilli.

Tcl **Childs Latite and coeval plutonic rocks - Latite flows and flow breccias** - Augite latite flows, flow breccia, flow agglomerate, minor hypabyssal, and more silicic tuffaceous rocks characterized by megacrystic plagioclase phenocrysts.

Tvu **Volcanic and volcaniclastic rocks, undivided** - Mapped along the international border as pyroclastic rocks of intermediate composition

Tpr Rhyolite of Pinkley Peak - Biotite rhyolite domes, flows, agglomerates, and tuffs - Biotite rhyolite domes, flows, agglomerates, and tuffs.

Tpt **Rhyolite of Pinkley Peak - Lithic lapilli tuff** - White to yellowish-green, poorly-sorted massive to well-bedded, commonly cross-bedded lithic lapilli tuff.

TKgs **Granite of Senita Basin** - White to gray, pink, or greenish, leucocratic, moderately-peraluminous garnet two-mica granite.

Jeg **Greenschist and metaconglomerate** - Green, biotite-epidote-chlorite schist and metaconglomerate, metagranite and metagranodiorite.

Japs **Quartzofeldspathic phyllite and semischist** - Gray, tan- to orange-weathering, highly leucocratic, very fine to fine-grained, locally lineated quartzofeldspathic schist in dynamothermal aureole of Granite of Senita Basin (TKgs). Contact with Granite of Senita Basin (TKgs) is gradational.

Jaq **Metamorphosed quartz porphyry** - Weathered green, gray, white, brown, or buff, usually leucocratic, very fine-grained, metamorphosed quartz porphyry.

Other Units

Rtc **Hillslope deposits and regolith** - This unit includes several different types of weathered bedrock, including granite, Oligo-Miocene felsic volcanic rocks and associated volcanoclastic sediments, and basalt. It also includes extensive areas of locally derived hillslope colluvium and coarse boulder and cobble talus.

d **Disturbed areas** - This unit depicts areas that have been profoundly disturbed by human activity and underlying geologic units cannot be observed. Mapped mostly along the international border, it includes the town of Lukeville and some mining sites that significantly alter geologic units.

dc **Drainage diversions, charcos, stocktanks, and water berms** - Disturbed areas due to drainage diversions, charcos, stocktanks and water berms.

Line Symbol Descriptions

contact, accurately located

contact, accurately located

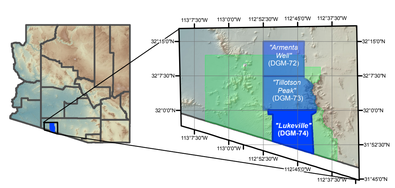
fault, accurately located

fault, approximately located

fault, concealed

Location Map

Mapped area shown in blue Organ Pipe Cactus National Monument shown in green



SCALE 1:24 000

1 0 0.5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET

2011 MAGNETIC NORTH DECLINATION

10.8°

Projection Information:
North American Datum of 1983.
1000-meter Universal Transverse Mercator grid tics, zone 12, shown in blue.

Topographic base from USGS 1:24,000 Quadrangle Series.
Seamless basemap generated using iGage All Topo Pro software.
Hillshade generated from NED 10m Digital Elevation Model.
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