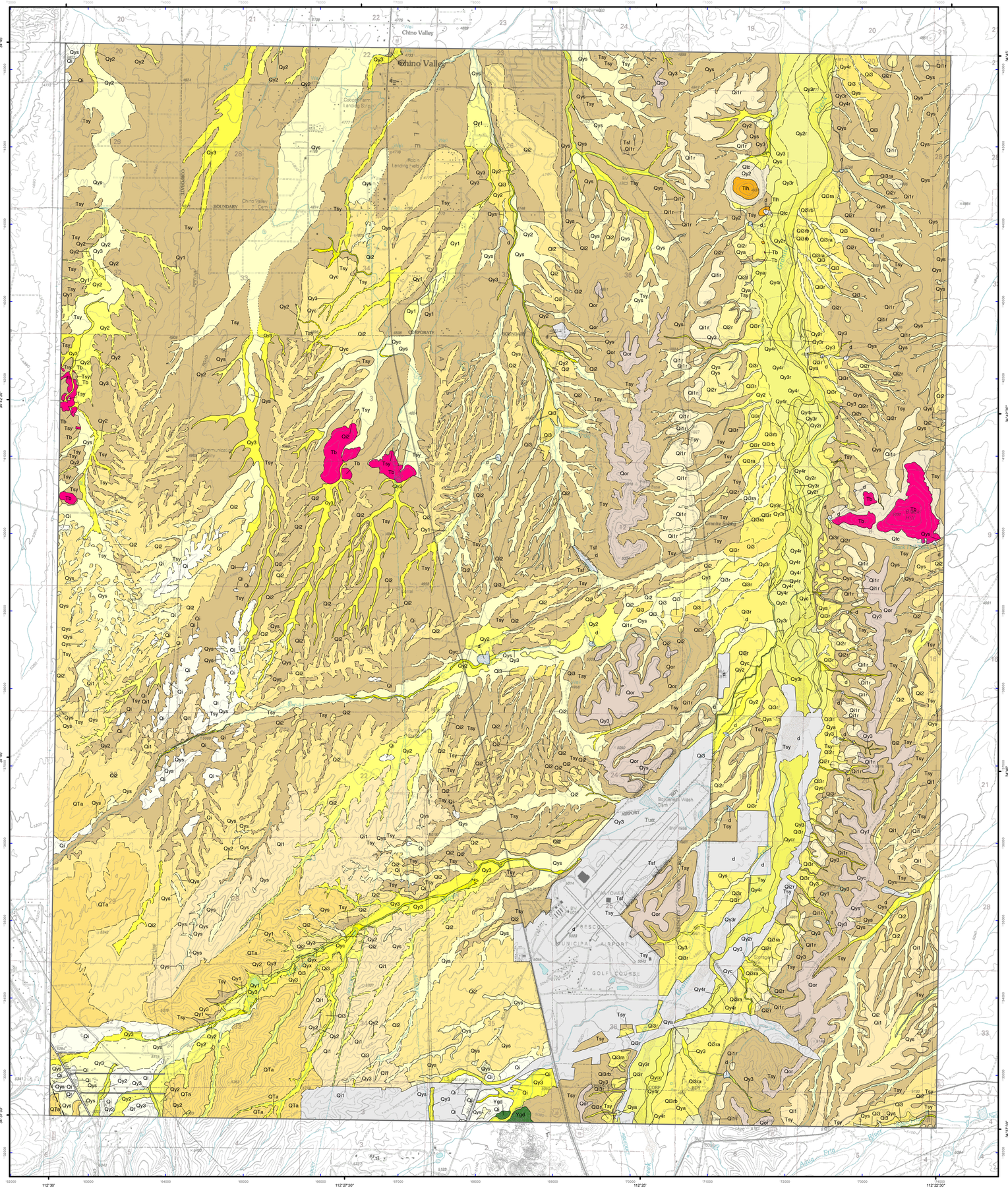
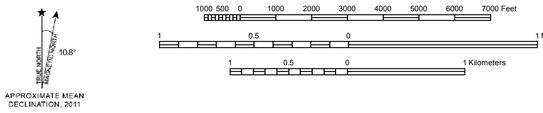
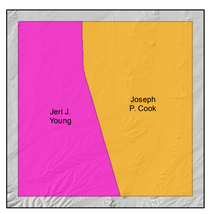


Topographic base from USGS 1:24,000 Quadrangle Series; generated using iGage All Topo Pro software
Contour interval: 10 feet

Projection: UTM Zone 12N
Datum: NAD83



Mapping Responsibility



Line Symbol Descriptions

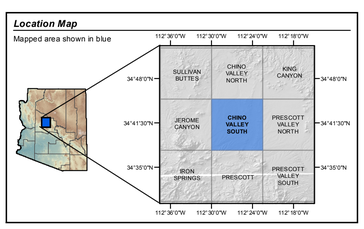
accurately located contact

approximately located contact

approximately located fault

Location Map

Mapped area shown in blue



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Introduction

The Chino Valley South 7 ½' Quadrangle is located north of Prescott, Arizona and encompasses the southern portion of Chino Valley immediately north of the Granite Dells and southeast of the Sullivan Buttes. Production of this new geologic map continues the Arizona Geological Survey mapping program of central Yavapai County that includes recent and concurrent mapping in the adjacent Jerome Canyon 7 ½' quadrangle to the west (Spencer and Young, 2012), Prescott Valley North 7 ½' quadrangle to the east (Youberg and Spencer, 2012), and the Chino Valley North 7 ½' quadrangle to the north (Gootee et al., 2010). This mapping was done under the joint State-Federal STATEMAP program, as specified in the National Geologic Mapping Act of 1992, and was jointly funded by the Arizona Geological Survey and the U.S. Geological Survey under STATEMAP assistance award number G10AC00428. Mapping was compiled digitally using ESRI ArcGIS software.

This map represents entirely new mapping of mainly surficial Quaternary and Tertiary sedimentary deposits. The majority of the Chino Valley South quadrangle is underlain by late Cenozoic clastic sedimentary deposits that are range from 400 to 1600 feet thick, increasing in thickness towards the western portion of the quadrangle (Richard et al., 2007). Aerial photography, stereo photo interpretation, topographic information, and field relationships such as soil color, clast type, degree of dissection, relative differences in deposit heights, landform morphology, and vegetation coverage types were used to distinguish different units. The area covered by this map can be characterized as an erosional landscape with little preservation of original landform surfaces, and rolling swales covered with soil and vegetation. The low-relief central and northern portion of the mapping area is made up mostly of ridges of Quaternary alluvial fan deposits that cap Tertiary sedimentary units, with swales, hillslopes, and broad flat areas often covered with soil. The southern portion of the mapping area can be characterized as somewhat high relief with deeply dissected alluvial fan deposits of varying ages, and little to no preservation of original surfaces or soil characteristics. In addition to alluvial fan deposits and older Tertiary basin-fill deposits, there are numerous relatively high standing river-cobble dominated terrace remnants that record deposition, valley-floor erosion, lateral channel migration, and incision by Granite Creek throughout the Pleistocene.

A normal fault with Quaternary slip has been mapped in the southwest corner of the Chino Valley South Quadrangle. The fault trends to the northwest and is part of a graben system that beheads Quaternary alluvial fan deposits, including fan deposits in the adjacent quadrangle to the west. The beheaded Quaternary alluvial fan deposits are dissected by northeast-trending channels; however, in the area of faulting, the channel networks are more anastomosing and exhibit reverse flow directions to the west and northwest.

GEOLOGIC MAP OF THE CHINO VALLEY SOUTH 7 ½' QUADRANGLE, YAVAPAI COUNTY, ARIZONA

Arizona Geological Survey Digital Geologic Map DGM-93, version 1.0
Scale 1:24,000

By
Jeri J. Young and Joseph P. Cook

October 2012

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Young, J.E. and Cook, J.P., 2012, Geologic map of the Chino Valley South 7 ½' Quadrangle, Yavapai County, Arizona: Arizona Geological Survey Digital Geologic Map DGM-93, version 1.0, scale 1:24,000.

Research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under USGS award number G10AC00428. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

Map Unit Descriptions

Other units

d — **Disturbed ground** - Heavily disturbed or altered ground due to aggregate mining, extensive excavation, construction of earth dams, residential developments, airports, golf courses, and highways.

Qtc — **Talus and colluvium** - Unconsolidated to weakly consolidated, locally derived, very poorly sorted angular rock debris deposited on and at the base of bedrock slopes and mantling highly eroded bedrock hills.

River alluvium

Qyr — **Active river channel deposits** - Deposits are dominantly unconsolidated, very poorly sorted sandy to cobbly beds exhibiting bar and swale microtopography but can range from fine silty beds to coarse gravelly bars in meandering reaches based on position within the channel. Clasts are typically well-rounded but may be angular to sub angular. Qyr deposits are typically unvegetated to lightly vegetated and exhibit no soil development. Qyr deposits are entrenched from 30 cm to 10 meters or more below adjacent early historical floodplain deposits depending on location, geomorphic relationship, and local channel conditions. These deposits are the first to become submerged during moderate to extreme flow events and can be subject to deep, high velocity flow and lateral bank erosion. In some areas, channel deposits are very thin to discontinuous exposing underlying bedrock. Extent of channel deposit and exposed bedrock varies and shifts with significant flooding.

Qyf — **Flood channel and low terrace deposits** - Deposits are found adjacent to active channels in the form of lightly vegetated in-channel bars, small planar fluvial terraces within 60 cm of river elevation, and recent erosional meanders outside the modern channel. Terrace deposits are inset into older river alluvium and are generally narrow, rarely exceeding 250 meters across. Qyf deposits are composed of poorly sorted unconsolidated sediments ranging from fine silts to gravel bars depending on location in the channel at the time of deposition. Well preserved bar and swale microtopography is common. Flotsam, Tamarisk debris wrapped around shrubs and small trees, and flow patterns from the most recent flow event large enough to inundate Qyf deposits may be present on part or all of the surface. Pebbles and cobbles are sub-rounded to sub-angular and include clast lithologies not present in local piedmont fan deposits. Qyf surfaces may become inundated under moderate to extreme flow events and can be subject to deep, high velocity flow and lateral bank erosion. These deposits do not exhibit soil development but may exhibit a light vegetation cover of weeds and grasses. Striated bands of shrubs mark former Granite Creek meanders.

Qyf — **Low river terrace, floodplain, and meander deposits** - Terrace deposits that occupy elevations from 1 to 2 meters above Qycr or Qyr deposits and are inset below the pre-incision historical floodplain. Qy3r surfaces are generally planar but exhibit bar and swale microtopography. No soil development is present but small shrubs and weeds sparsely inhabit the surface. Fine grained vegetation mounds or small nebkhas are present beneath many of the shrubs present on the surface. Sediments composing these deposits are poorly sorted silt, sand, pebbles and cobbles. Pebbles and cobbles are well-rounded to sub-angular. Trough crossbedding, ripple marks, and stacked channel deposits observable in modern channel walls indicate deposition in a low to moderate energy braided to meandering stream environment with some episodes of rapid flood erosion and deposition. These deposits are prone to flooding during extreme flow events, and undercutting and rapid erosion of Qy3r surfaces is possible during larger flow events.

Qyf — **River terrace and floodplain deposits** - Broadly planar surfaces that stand up to 2-3 meters above modern Qycr deposits. Qy2r surfaces appear predominantly fine grained at the surface due in part to windblown dust deposition but are largely composed of interfingering coarse sandy to pebbly braided channel and fine silty to sandy river channel and floodplain deposits. Little to no soil development is evident in cross section however incipient calcium carbonate accumulation is present in some pebbly beds and lenses. Fairy Duster is the dominant shrub and short bunch grass provides ground cover on the majority of the surface. Clusters of Fairy Duster forming vegetated mounds are found along the edges of Qy2r surfaces near Granite Creek and some smaller tributary fan channels. Qy2r deposits are not subject to inundation by river floods where the active channel is moderately to deeply incised, but they may be flood-prone in areas with less channel incision. Qy2r deposits are subject to rapid erosion and bank failure due to undercutting and lateral erosion during floods and large flow events.

Qyf — **Elevated river terrace and former floodplain deposits** - Deposits associated with slightly higher terraces that represent either higher elements of the early historical floodplain or remnants of older Holocene aggradation periods. Qy1r deposits are broadly planar with mild to moderate undulation in areas where internal drainage patterns have developed. Vegetative cover consists of a bunch grass ground cover with sparsely spaced 1-2 meter tall brushy oak trees concentrated on the rounded edges of the surface. Qy1r surfaces are generally sandy to pebbly on the surface with more heavily vegetated areas retaining more windblown silts, sometimes forming vegetation mounds. Soil development is absent to mild. A light dusting (incipient stage I) calcium carbonate accumulation is evident on the undersides of some buried clasts. Qy1r surfaces stand 3 to 4 meters above the modern channel.

Qia — **Abandoned Granite Creek terrace deposits, undivided** - Qi3r deposits consist of widespread planar river terraces standing up to 3 meters above adjacent Holocene Granite Creek deposits. These deposits range from composing the active Granite Creek channel wall to distal terrace remnants up to 1 kilometer outside the modern channel. The extensive planar portion of Qi3r deposits is fine grained at the surface and covered by small bunch grasses with approximately 1 meter spacing, 0.5 meter tall cholla with 3-4 meter spacing, 1 meter tall Fairy Duster clusters forming vegetated mounds. The fine to coarse sandy surface soil mantling Qi3r deposits is medium brown (5-7.5 YR 4/4) in color with no significant clay or calcium carbonate accumulation evident near the surface. The rounded edges of Qi3r terraces nearest Granite Creek are populated by 1-3 meter tall oak trees. Incision into the margins of these deposits exposes abundant well rounded cobbles to small boulders. Clast composition is largely composed of granite, gneiss, intermediate metamorphic rocks, and some vesicular basalt. Qi3r terraces are internally drained and have been incised into by tributary drainage networks initiating higher in the piedmont. Many of these drainages are broad, well rounded, unincised swales within Qi3r terraces rather than sharply defined arroyo like channels. Qi3r deposits are inset into adjacent piedmont alluvial deposits, basin fill remnants, reworked basin fill deposits, or older river gravel terraces. Locally, late Pleistocene river terraces are subdivided into 2 members (Qi3ra and Qi3rb) that have similar physical characteristics.

River alluvium, cont. . .

Qirb — **Abandoned Granite Creek terrace deposits, younger member** - Lowest Pleistocene Granite Creek terraces in the landscape.

Qira — **Abandoned Granite Creek terrace deposits, older member** - Occupy slightly higher positions in the landscape than Qi3rb terrace remnants.

Qir — **High standing, isolated Granite Creek terrace remnants** - Terrace deposits are similar to Qi3r deposits but occupy higher positions in the landscape, up to 12 meters above the modern channel. Terrace surfaces are planar where extensive and slightly to moderately rounded near the edges. Clast composition is diverse. Well-rounded pebbles to cobbles with stage I-II calcium carbonate accumulation armor Qi2r surfaces and otherwise easily eroded underlying Tsy deposits. Tall mounds of Tsy deposits are generally capped by Qi2r or older coarse river cobble deposits. Vegetative cover is low and consists of closely spaced short bunch grass and isolated 30 cm tall cholla. Soil on Qi2r surfaces appears medium brown to reddish (5-7.5 YR 5/4) in color. The eroded moderately well rounded edges and flanks of Qi2r terraces are covered by well rounded cobbles and boulders. Qi2r terrace remnants are typically inset into Tsy deposits and isolated from one another by incised drainages grading towards Granite Creek. The edges of Qi2r terrace remnants closest to the valley axis and Granite Creek are often sinuous, resembling river meanders, and match nearby Qi2r terrace edge patterns to the north and south. This pattern results from channel migration, incision, and subsequent erosion of previously more laterally extensive Qi2r deposits by Granite Creek in the Pleistocene. The resulting pattern in the landscape in plan view is islands of Qi2r terraces deposited atop Tsy deposits inset below and closer to the valley axis than older Pleistocene Granite Creek terrace remnants. Matching Qi2r terrace remnants are often visible across Granite Creek over 1.5 kilometers away.

Qir — **Very high standing, isolated Granite Creek terrace remnants** - Granite Creek terrace remnants standing higher in the landscape than Qi2r deposits, up to 25 meters above the modern channel. These deposits are moderately rounded to well rounded near the edges with relatively planar sections near the center of extensive, well preserved remnants. Qi1r deposits appear dark red with white outcrops on aerial photos due to high clay and calcium carbonate accumulation. In some areas, especially near the edges of terrace remnants, soil carbonate has been exposed at the surface by prolonged erosion and bioturbation. Soil on preserved portions of Qi1r terraces appears dark brown to red (5 YR 4/6) in color. Clasts exposed at the surface are mildly to moderately varnished. Large pebble to cobble size clasts are found across the surface rather than predominantly along the edges and flanks of the surface as observed in younger Pleistocene Granite Creek terraces. Much like Qi2r deposits, vegetation on Qi1r deposits is sparse consisting of bunch grasses and widely spaced cholla. Like Qi2r terrace remnants, Qi1r remnants are deposited atop Tsy deposits and help preserve more erodible underlying finer grained Tsy deposits. Paired Qi1r islands on each side of Granite Creek are typically more than 2 kilometers apart.

Qor — **Paleo-Granite Creek terrace deposits** - Qor deposits are the highest standing Granite Creek deposits in the landscape standing up to 40 meters above the modern channel. These deposits are broadly rounded with moderately planar crests where extensive and well preserved, cap and preserve underlying Tsy deposits, are deeply dissected, and are located up to 2 kilometers outside present day Granite Creek. Paired Qor deposits across Granite Creek are up to 3 kilometers apart. Soil on preserved sections of Qor deposits is red (2.5 YR 3/4), very clay and calcium carbonate rich with strong waxy clay peds and clay coated clasts evident just below the surface. Much like Qi1r deposits, Qor deposits appear red with regions of white on aerial photos due to significant clay accumulation and exposure of soil carbonate through bioturbation and erosion. Clast cover is dominated by well rounded large pebbles to small boulders. Many clasts show evidence of churning or having been overturned based on calcium carbonate collars and rinds formed on the undersides of clasts instead facing upward or otherwise exposed at the surface. Vegetation on Qor deposits consists of bunch grass ground cover, small shrubs, and desert holly limited in extent to north facing rounded edges and concave eroded areas just below preserved crests of terrace remnants. Qor deposits record the highest preserved level of deposition by Granite Creek in Chino Valley.

Piedmont alluvium

Qyp — **Active channel deposits** - Qyc deposits are composed of unconsolidated, very poorly sorted sandy to cobbly ephemeral piedmont channel sediments. Channels may exhibit bar and swale microtopography with bars composed of coarser sediments. Qyc deposits are typically unvegetated and exhibit no soil development although small shrubs and grasses may be found on slightly elevated in-channel bars. Qyc deposits commonly become submerged during moderate to extreme flow conditions and can be subject to deep, high velocity flow and lateral bank erosion. Channels are generally incised 0.25 to 1.5 meters below adjacent Holocene alluvium and may be incised into adjacent Pleistocene alluvium by 2 meters or more.

Qyp — **Low swales, tributary drainages, and weakly incised channels** - Recently active piedmont alluvium located primarily along active drainages including floodplain, low-lying terrace, less active tributary drainages to Qyc channels, and distal reaches of active fan channels that have aggraded and transitioned to distributary flow and infiltration. Qy3 deposits are composed of unconsolidated to very weakly consolidated unvarnished sandy to pebbly deposits. Qy3 drainages are often wider, lower energy, and more heavily vegetated than the Qyc channels they drain into. The gradient of some Qy3 channels draining high standing Tsy deposits may be significantly steeper than similar channels lower in the piedmont yet incision is generally absent or mild. Infiltration capacity appears high in these broad, gentle swales. Surface flow likely only occurs after soil saturation has been achieved. Grass growing along the low center of many swales is often a shade greener due to greater available soil moisture. Soil development is generally absent or incipient on Qy3 deposits which exhibit pale buff to light brown (10 YR) surface coloration.

Qya — **Active alluvial fan deposits** - Low relief splays, fine grained distributary alluvial fan deposits comprising the active portion of alluvial fans where channel flow becomes unconfined. Qya deposits are typically found at the downstream outlet of discontinuous ephemeral channels and gullies. Qya deposits are extremely prone to flooding and channel migration. Sediments are unconsolidated and consist of very poorly sorted sand to small cobbles. Vegetation on Qya deposits consists of bunch grass, small shrubs, and weeds.

Qyx — **Active arroyos** - Steep-sided incisions or arroyos that are 1 to several meters deep with migrating head-cuts. They are often found dissecting Holocene deposits.

Piedmont alluvium, cont. . .

Qys — **Sheetflood deposits and swales** - Unconsolidated, laterally extensive, very fine silty to sandy sheetflow transported alluvium. Qys deposits are very thin (less than 10-30 cm thick in most cases) and mantle older alluvium. Qys alluvium is deposited in low energy broad swales where only the smallest sediments are able to be transported. Eolian reworking and deposition is evident in broad Qys reaches and vegetation mounds are common. Occasionally weakly channelized flow is occurs but minor gradient changes or vegetation cause aggradation that leads again to sheetflow or infiltration. Grasses growing in the low center of the swale sometimes appear slightly larger or greener due to locally more abundant soil moisture. Soil development is weak to absent.

Qyc — **Broad drainages and piedmont terrace deposits** - Qy2 deposits consist of piedmont terrace deposits located primarily along the flanks of incised drainages and low-relief terraces inset into Pleistocene age fan or river deposits. These deposits consist of predominantly fine grained unconsolidated to weakly consolidated sediments with sub-rounded to sub-angular pebble to cobble bars on the surface and beds and lenses in cross section. Where inset into older alluvium, Qy2 deposits are planar with remnant bar and swale microtopography. Soil development on Qy2 deposits is minor, characterized by incipient stage I-II calcium carbonate accumulation in the form of small filaments and medium brown (10 YR) surface coloration. Vegetation on Qy2 surfaces consists of small shrubs, weeds, bunch grass, and occasional yucca and cholla. These surfaces are subject to inundation during moderate to extreme flow conditions when channel flow exceeds capacity or due to channel migration on low-relief portions of broad distal fan deposits. Planar Qy2 terraces are typically elevated from 30 cm to 1.5 meters above active channels.

Qy1 — **High standing broad drainages an piedmont terraces** - Qy1 deposits consist of planar terraces along larger fan drainages inset into older alluvium. They stand 1-2 meters higher in the landscape than Qy2 deposits, are not part of the modern drainage system except possibly under flood conditions, and partially overlie Pleistocene deposits in some areas. Qy1 deposits are composed of sandy to pebbly swales with coarser unvarnished to very lightly varnished pebble to cobble bars. Bar and swale microtopography is somewhat muted by eolian deposition and vegetation mounding. Pebbles and cobbles exposed in cross section exhibit stage I-II calcium carbonate accumulation within a medium brown matrix of fine sand to silt. Vegetation on Qy1 deposits is similar to that found on Qy2 deposits; small shrubs, weeds, bunch grass, and occasional yucca and cholla.

Qi — **Pleistocene alluvial fan deposits, undivided** - Undifferentiated early to middle Pleistocene alluvial deposits that generally overlie older Tertiary sedimentary deposits. This unit varies greatly in thickness due to lack of preservation.

Qip — **Planar, elevated piedmont fan and terrace deposits** - Broadly planar terrace and fan deposits standing up to 2 meters above adjacent Holocene (Qyc, Qy3+, and Qys) deposits. Surface soil on Qi3 deposits is mildly reddened (7.5 YR) and overall fine grained. Most Qi3 deposits appear to overlie highly eroded Tsy deposits and are likely less than several meters thick. Vegetation on Qi3 deposits is composed of bunch grass ground cover with widely spaced cholla and yucca. Qi3 deposits located near Granite Creek grade towards similarly aged Qi3r deposits.

Qih — **Higher standing piedmont terrace and ridge capping deposits** - Broadly planar to moderately rounded pebble to cobble dominated terrace and fan deposits capping underlying Tsy deposits. Qi2 deposits are elevated 2-3 meters above adjacent Holocene (Qyc, Qy3, and Qys) piedmont deposits . Qi2 deposits often form long linear ridge capping deposits atop Tsy basin filling sediments. These broadly rounded caps are reddened (5-7.5 YR 4/3) relative to uncapped Tsy deposits observed elsewhere. Widespread incision and denudation into uncapped Tsy deposits has resulted in Qi2 capped ridges standing higher in the landscape than uncapped Tsy deposits. Vegetation Qi2 deposits ranges from grassy ground cover with occasional small shrubs and weeds to grassy hills dotted with desert holly and manzanita.

Qir — **High standing relict alluvial fan remnants** - Qi1 deposits are relict alluvial fan remnants overlying Tsy sediments that stand higher in the landscape than Qi2 and younger deposits. Qi1 deposits are broadly rounded and exhibit deeply incised mature tributary drainage networks. Tsy sediments overlain by Qi1 deposits are protected from erosion by the coarse pebble and cobble cover deposited by Granite Creek in the Pleistocene. Coarse gravel and cobble lag derived from the Qi1 cap also covers the flanks of finer grained Tsy deposits. Uncapped Tsy deposits are more easily eroded and are reduced to low hills and broad swales. Vegetation on Qi1 deposits consists of grasses and small shrubs with clusters of desert holly and oak mostly on the north facing eroded edges of terrace remnants. Qi1 deposits are removed from the modern drainage system, occupying and helping preserve high ridge tops in the landscape, yet numerous drainages deeply incised into underlying Tsy deposits have undermined capping deposits resulting in a branching or dendritic appearance in plan view.

QTa — **Alluvial deposits, undivided (Quaternary to late Tertiary)** - Coarse-grained sand and gravel proximal to source areas, and more distal, finer-grained gravel, sand and silt toward the northeast (basinward). Multiple depositional and erosion cycles as expressed by multiple erosional surfaces; however, consistent distinction of each level is difficult due to limited exposure.

Basin Fill deposits

Tsy — **Basin fill deposits** - Moderately to strongly consolidated silts, sands, and gravels deposited in basins during and after late Tertiary faulting. Tsy deposits include lesser amounts of mudstone and siltstone. Tsy deposits are generally light to medium brown to tan (7.5 YR 6/4) in color. They commonly form high rounded hills and ridges in modern basins, and locally form prominent bluffs when overlain by more consolidated, erosion resistant deposits (unit Qi1r, Qi2r, Qor, Qi2, and Qi1). These deposits form gently rolling, low relief hills throughout the map area broadly dissected by tributary drainage networks (unit Qy3, Qyx, and Qys). Where observed, fine grained basin fill deposits were mapped as unit Tsf. Everywhere else, broadly rounded basin fill hills and swales were mapped as unit Tsy. Vegetation on Tsy deposits ranges from bunch grass ground cover and small shrubs in lowlands to yucca, Fairy Duster, and oak on predominantly well rounded north facing slopes and swales on high standing Tsy deposit capped by Pleistocene river or piedmont cobbles. Tsy deposits are exposed widely in dissected basins of southeastern and central Arizona.

Tsf — **Basin fill deposits, fine grained facies** - Fine grained member of Tsy basin fill deposits. Exposure of Tsy bedding is rare in the natural landscape but roadcuts near the Prescott Municipal Airport in the southern portion of the mapping area, excavations along canals in ranches to the north, and heavily rilled high standing, river gravel capped Tsy deposits provide isolated glimpses of the uppermost 3-4 meters of underlying basin fill. These cuts expose predominantly fine grained silty to sandy beds with occasional pebble interbeds. Some reworked soil carbonate was observed as well as calcium carbonate cemented fractures within the upper 2-3 meters of exposed basin fill sediments.

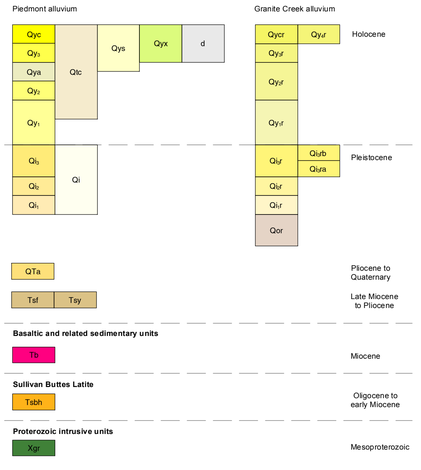
Bedrock units

Tb — **Olivine basalt** - Locally vesicular olivine basalt with 3-5%, <1mm olivine or its iron-oxide alteration products.

Tlh — **Hornblende latite** - Medium- to light-gray lava flows or shallow intrusions, containing ~4-7%, <1mm hornblende.

Ygd — **Dells Granite** - Massive, medium- to coarse-grained, porphyritic biotite granite, with K-feldspar phenocrysts up to 5 cm (Krieger, 1965). This rock unit is dated at approximately 1400 +/- 15 million years (Silver et al., 1980, U-Pb dating of zircon). It also contains unusually high uranium concentrations for a granitic rock (Proctor et al., 1993), and has produced exceptionally high radon levels in at least one overlying home (Kearfott, 1989).

Stratigraphic Correlation Diagram



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