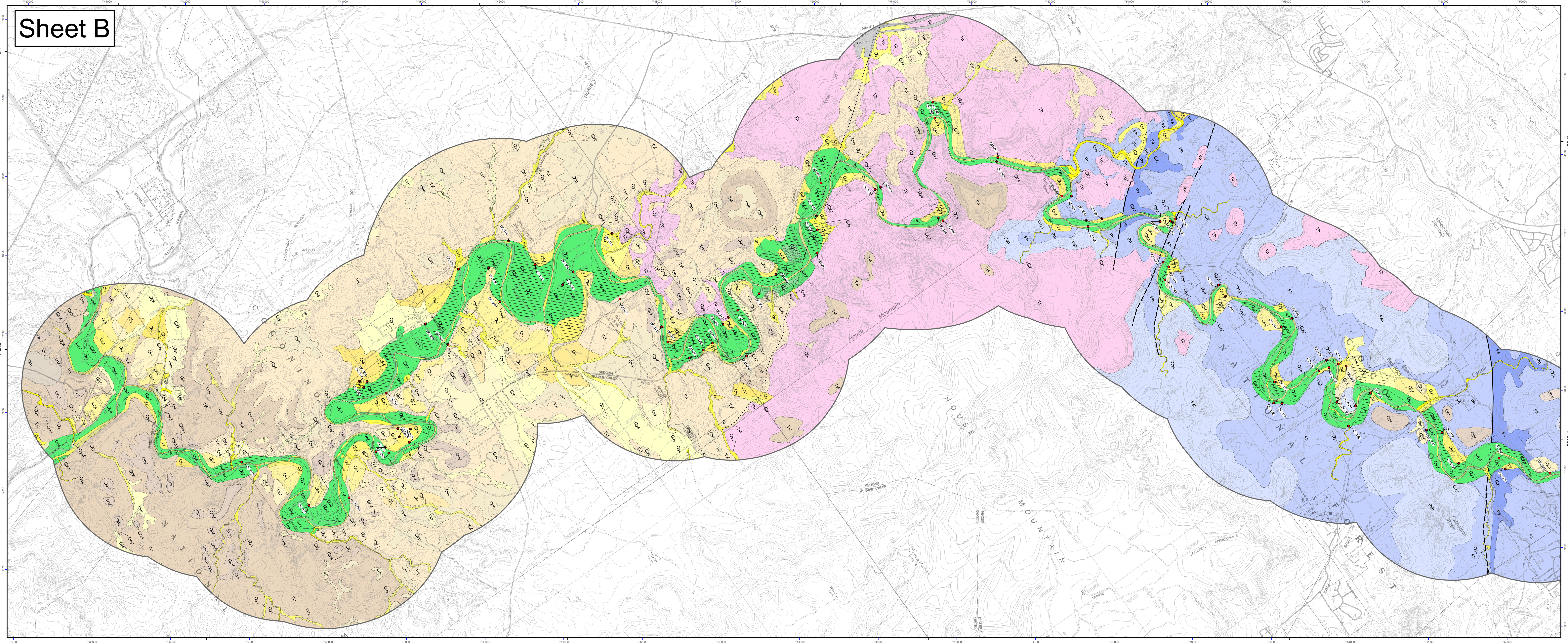

Map Unit Descriptions

Other units

- **d** — **Disturbed ground** - heavily disturbed ground due to agriculture, extensive excavation, mining activity, or construction of earth dams
- **Qvc** — **Regolith and colluvium formed on deposits of the Verde Formation** - generally fine-grained, in situ deposits mantling gentle slopes on the Verde Formation
- **Plowed areas** - historically or actively plowed fields, irrigated pastures, and other lightly disturbed ground

River Alluvium

- **Qy5r** — **Active river channel deposits** - unconsolidated, poorly to very poorly sorted sand to boulder deposits in active river channels. Deposits in narrow canyon reaches are very thin to discontinuous exposing underlying bedrock. Deposits are typically unvegetated to lightly vegetated and exhibit no soil development
- **Qy5b** — **Bedrock lined river channel** - portions of the active channel where flow passes directly over exposed bedrock. A discontinuous layer of pebbles to boulders may be present but smooth, polished bedrock lines the channel bottom
- **Qy4r** — **Flood channel and low terrace deposits** - unconsolidated sand, gravel, silt and clay deposits on bars, flood channels, and low terraces. Deposits form lightly vegetated in-channel bars, channels occupied by flow in flood events, and small planar fluvial terraces less than 4 feet above the active channel
- **Qy3r** — **Historical river terrace deposits** - unconsolidated, poorly sorted sand, gravel, silt and clay deposits on low terraces and high bars within the modern floodplain
- **Qy2r** — **Late Holocene to historical river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on terraces adjacent to the modern floodplain. Surfaces are typically planar with with tabular or lenticular gravel lenses
- **Qy1r** — **Late to early Holocene river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on slightly higher terraces adjacent to the modern floodplain. Surfaces typically are planar with local gully development
- **Ql3r** — **Late Pleistocene river terrace deposits, undivided** - gravelly, sandy river terrace deposits 15 to 65 feet above the active river channel. Deposits consist of well rounded to rounded pebbles to cobbles with cross-bedded coarse sandy interbeds. Clast lithologies are diverse
- **Ql2r** — **Middle to late Pleistocene river terrace deposits, undivided** - high-standing, cobbly to sandy river terrace deposits exhibiting moderate to strong clay development and calcium carbonate accumulation
- **Ql1r** — **Middle Pleistocene river terrace deposits, undivided** - higher-standing, cobbly to sandy river terrace deposits exhibiting strong to very strong clay development and calcium carbonate accumulation
- **Qo3r** — **Early Pleistocene river terrace deposits, younger** - very high standing, old river terrace deposits, lower level
- **Qo2r** — **Early Pleistocene river terrace deposits, middle** - very high standing, old river terrace deposits, middle level
- **Qo1r** — **Early Pleistocene river terrace deposits, older** - very high standing, old river terrace deposits, upper level
- **Qor** — **Early Pleistocene river terrace deposits, undivided** - well rounded consolidated pebble to cobble river conglomerate
- **QTor** — **Late Pliocene to early Pleistocene river deposits** - moderately consolidated, coarse river terrace or alluvial fan deposits capping Table Mesa southwest of Sedona about 700 ft above the modern Oak Creek channel

Piedmont Alluvium

- **Qyc** — **Modern stream channel deposits** - active channel deposits composed of very poorly-sorted sand, pebbles, and cobbles with some boulders to moderately-sorted sand and pebbles
- **Qy3** — **Latest Holocene alluvium** - unconsolidated, very poorly sorted silty to cobbly low terrace and overflow channel deposits
- **Qyaf** — **Late Holocene alluvium, active fan deposits** - active portions of young fan deposits exhibiting distributary drainage patterns
- **Qy2** — **Late Holocene alluvium** - planar terrace deposits located along incised drainages, broad low-relief distal fan deposits onlapping onto Holocene river alluvium, and infrequently active tributary drainage deposits
- **Qy1** — **Older Holocene alluvium** - broad, low-relief, undulating fan deposits ehxibiting widespread, shallow braided drainage patterns
- **Qys** — **Holocene fine-grained deposits** - unconsolidated alluvium derived predominantly from basin fill deposits
- **Qy** — **Holocene alluvium, undivided** - Holocene alluvium, undivided
- **Qis** — **fine-grained Pleistocene deposits** - older fine-grained deposits derived primarily from the Verde Formation
- **Ql3** — **Late Pleistocene alluvial fan and terrace deposits** - weakly consolidated sandy gravel deposits with moderate soil development
- **Ql2** — **Middle to late Pleistocene alluvial fan and terrace deposits, undivided** - weakly consolidated sandy gravel deposits with strong soil development
- **Qo1** — **Early Pleistocene alluvium, older member** - high, thin, early Pleistocene alluvial fan remnants deposited on erosional surfaces cut on the Verde Formation

Cenozoic Basin Deposits

- **Tvl** — **Late Miocene to Pliocene Verde Formation, lacustrine carbonate facies** - fine-grained, laminated playa and lacustrine deposits
- **Tvf** — **Late Miocene to Pliocene Verde Formation, fluvial clastic facies** - fine to medium grained, carbonate-cemented, reddish arenite interbedded with marls and white to buff massive limestones
- **Tsy** — **Late Miocene to Pliocene deposits** - moderately to strongly indurated conglomerate and sandstone basin fill deposits

Bedrock units

- **Tb** — **Tertiary basalt, undivided** - Tertiary basalt flows, associated cinder cones and pyroclastic rocks, intrusive basalts, and mafic rocks
- **Psh** — **Schnebly Hill Formation** - tan to light-gray, eolian, crossbedded sandstone and minor mudstone, limestone, and evaporitic beds (DeWitt et al., 2008)
- **Ph** — **Hermit Shale** - Permian Hermit Shale
- **Ps** — **Supai Formation** - Permian and Upper Pennsylvanian mudstone, siltstone, sandstone, limestone and dolomite

Bedrock and surficial geologic mapping for areas outside the lateral limits of Holocene river alluvium was compiled from the following sources

DeWitt, Ed, Langenheim, Victoria, Force, Eric, Vance, R.K., Lindberg, P.A., Driscoll, R.L., 2008, Geologic Map of Prescott National Forest and the Headwaters of the Verde River, Yavapai and Coconino Counties, Arizona: U.S. Geological Survey Scientific Investigations Map 2996, scale 1:100,000, 100-p.

House, P.K., Pearthree, P.A., Cook, J.P., and Bigio, E.R., in press, Geologic map of the Page Springs 7 1/2' quadrangle, Yavapai County, Arizona: Arizona Geological Survey Digital Geologic Map 83, scale 1:24,000.

House, P.K., Pearthree, P.A., Cook, J.P., and Bigio, E.R., in press, Geologic map of the Cornville 7 1/2' quadrangle, Yavapai County, Arizona: Arizona Geological Survey Digital Geologic Map 85, scale 1:24,000.

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SURFICIAL GEOLOGIC MAP OF OAK CREEK, WET BEAVER CREEK, WEST CLEAR CREEK, FOSSIL CREEK, AND THE EAST VERDE RIVER, CENTRAL ARIZONA

by
Bigio, E.R., Pearthree, P.A., and Cook, J.P.

October 2010
Arizona Geological Survey
Digital Map DM-RM-3B
version 1.0

Funding for this project was provided by the Arizona Department of Water Resources

USGS 24k quadrangle series topographic base maps. North American Datum of 1983. Projection and 1000-meter grid ticks (blue): Universal Transverse Mercator, zone 12.

Boundaries of Holocene River Alluvium

Thin, Solid Line - Clearly defined, accurately located contacts between Holocene river alluvium and bounding geologic units such as bedrock hillslopes, abruptly incised channels or alluvial terraces, and distinct edges of small, steep alluvial fans and talus slopes. Line location accurate to within 50 feet.

Thin, Dashed Line - Subtle or gradational contacts between Holocene river alluvium and bounding geologic units. These boundaries are often associated with very low relief distal alluvial fan onlap onto Holocene river alluvium and are often located in historically plowed fields. Line location accurate to within 100 feet.

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Location Map

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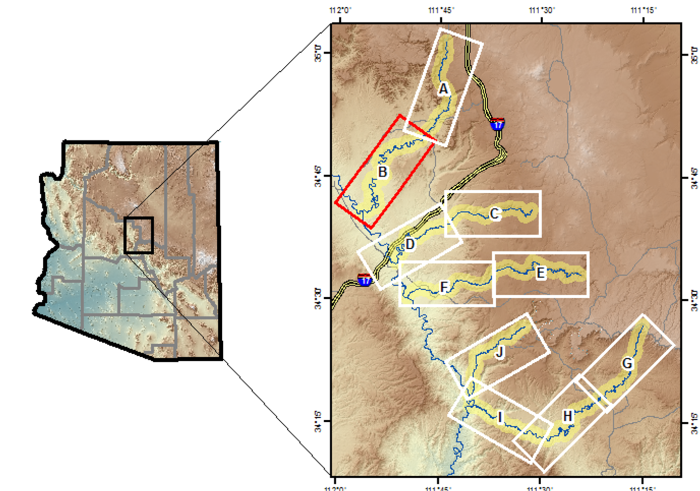

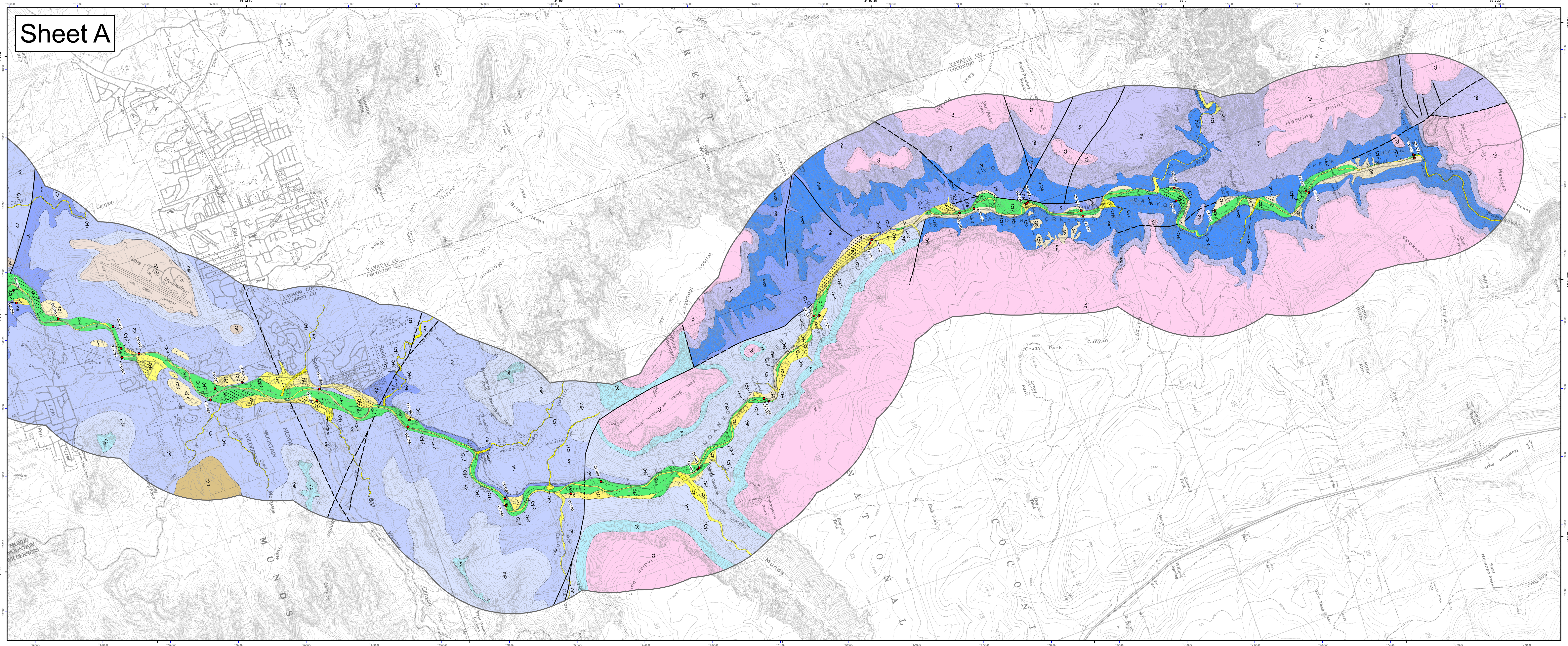

Map Unit Descriptions

Other units

- **Qtc** — **Quaternary hillslope talus and colluvium** - unconsolidated to weakly consolidated, very poorly sorted angular rock debris deposited at the base of bedrock slopes
- **Plowed areas** - historically or actively plowed fields, irrigated pastures, and other lightly disturbed ground

River Alluvium

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- **Qy2r** — **Late Holocene to historical river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on terraces adjacent to the modern floodplain. Surfaces are typically planar with with tabular or lenticular gravel lenses
- **Qy1r** — **Late to early Holocene river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on slightly higher terraces adjacent to the modern floodplain. Surfaces typically are planar with local gully development
- **Ql3r** — **Late Pleistocene river terrace deposits, undivided** - gravelly, sandy river terrace deposits 15 to 65 feet above the active river channel. Deposits consist of well rounded to rounded pebbles to cobbles with cross-bedded coarse sandy interbeds. Clast lithologies are diverse
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Piedmont Alluvium

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- **Qy3** — **Latest Holocene alluvium** - unconsolidated, very poorly sorted silty to cobbly low terrace and overflow channel deposits
- **Qyaf** — **Late Holocene alluvium, active fan deposits** - active portions of young fan deposits exhibiting distributary drainage patterns
- **Qy2** — **Late Holocene alluvium** - planar terrace deposits located along incised drainages, broad low-relief distal fan deposits onlapping onto Holocene river alluvium, and infrequently active tributary drainage deposits
- **Qys** — **Holocene fine-grained deposits** - unconsolidated alluvium derived predominantly from basin fill deposits

Cenozoic Basin Deposits

- **Tsy** — **Late Miocene to Pliocene deposits** - moderately to strongly indurated conglomerate and sandstone basin fill deposits

Bedrock units

- **Tb** — **Tertiary basalt, undivided** - Tertiary basalt flows, associated cinder cones and pyroclastic rocks, intrusive basalts, and mafic rocks
- **Pk** — **Kaibab Formation** - lower Permian silty to sandy dolomite, dolomitic and cherty limestone, and lenses of fine grained sandstone (Weir et al., 1989)
- **Psh** — **Schnebly Hill Formation** - tan to light-gray, eolian, crossbedded sandstone and minor mudstone, limestone, and evaporitic beds (DeWitt et al., 2008)
- **Ph** — **Hermit Shale** - Permian Hermit Shale
- **Ps** — **Supai Formation** - Permian and Upper Pennsylvanian mudstone, siltstone, sandstone, limestone and dolomite
- **Pc** — **Coconino Sandstone** - light gray to tan, fine-grained eolian, cross-bedded sandstone
- **Ptcs** — **Toroweap Formation,Coconino Sandstone, and upper Supai Formation, undivided** - compiled from Weir et al., 1989

Bedrock and surficial geologic mapping for areas outside the lateral limits of Holocene river alluvium was compiled from the following sources

DeWitt, Ed, Langenheim, Victoria, Force, Eric, Vance, R.K., Lindberg, P.A., Driscoll, R.L., 2008, Geologic Map of Prescott National Forest and the Headwaters of the Verde River, Yavapai and Coconino Counties, Arizona: U.S. Geological Survey Scientific Investigations Map 2996, scale 1:100,000, 100-p.

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by
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October 2010
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Digital Map DM-RM-3A
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Funding for this project was provided by the Arizona Department of Water Resources

USGS 24k quadrangle series topographic base maps. North American Datum of 1983. Projection and 1000-meter grid ticks (blue): Universal Transverse Mercator, zone 12.

Boundaries of Holocene River Alluvium

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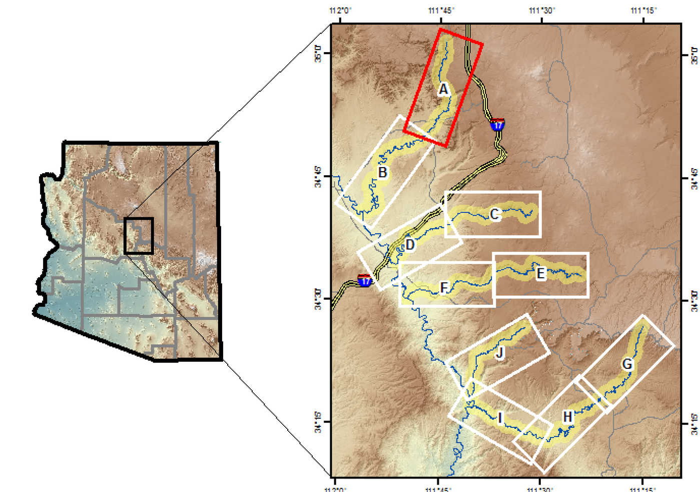

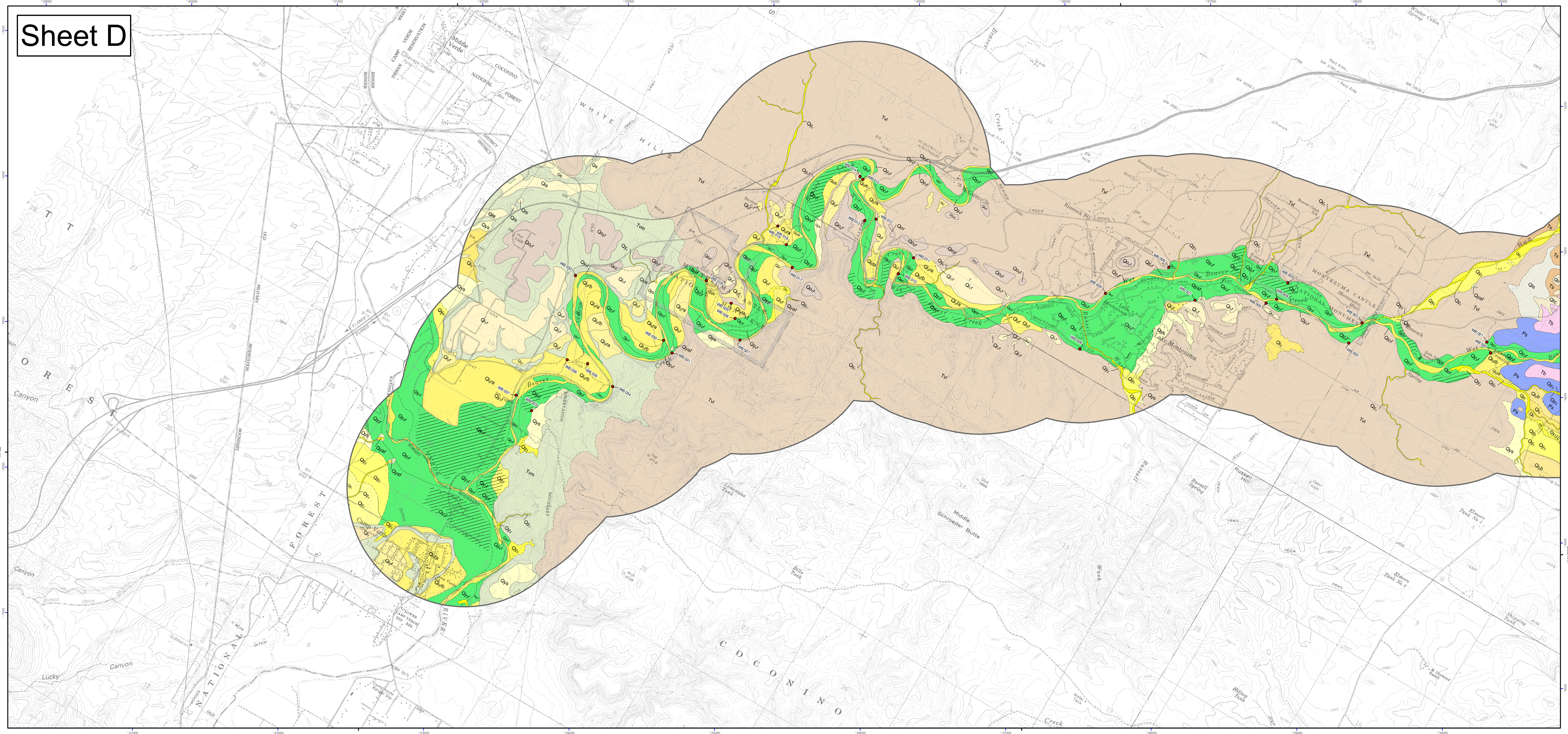

Map Unit Descriptions

Other units

Qtc — **Quaternary hillslope talus and colluvium** - unconsolidated to weakly consolidated, very poorly sorted angular rock debris deposited at the base of bedrock slopes

Plowed areas - historically or actively plowed fields, irrigated pastures, and other lightly disturbed ground

River Alluvium

Qy$_c$r — **Active river channel deposits** - unconsolidated, poorly to very poorly sorted sand to boulder deposits in active river channels. Deposits in narrow canyon reaches are very thin to discontinuous exposing underlying bedrock. Deposits are typically unvegetated to lightly vegetated and exhibit no soil development

Qy$_c$b — **Bedrock lined river channel** - portions of the active channel where flow passes directly over exposed bedrock. A discontinuous layer of pebbles to boulders may be present but smooth, polished bedrock lines the channel bottom

Qy$_4$r — **Flood channel and low terrace deposits** - unconsolidated sand, gravel, silt and clay deposits on bars, flood channels, and low terraces. Deposits form lightly vegetated in-channel bars, channels occupied by flow in flood events, and small planar fluvial terraces less than 4 feet above the active channel

Qy$_3$r — **Historical river terrace deposits** - unconsolidated, poorly sorted sand, gravel, silt and clay deposits on low terraces and high bars within the modern floodplain

Qy$_2$r — **Late Holocene to historical river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on terraces adjacent to the modern floodplain. Surfaces are typically planar with with tabular or lenticular gravel lenses

Qy$_1$r — **Late to early Holocene river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on slightly higher terraces adjacent to the modern floodplain. Surfaces typically are planar with local gully development

Qi$_3$rb — **Late Pleistocene river terrace deposits, younger member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel

Qi$_3$ra — **Late Pleistocene river terrace deposits, older member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel

Qi$_3$r — **Late Pleistocene river terrace deposits, undivided** - gravelly, sandy river terrace deposits 15 to 65 feet above the active river channel. Deposits consist of well rounded to rounded pebbles to cobbles with cross-bedded coarse sandy interbeds. Clast lithologies are diverse

Qi$_2$rb — **Middle to late Pleistocene river deposits, younger member** - high-standing, cobbly to sandy river terrace deposits exhibiting moderate to strong clay development and calcium carbonate accumulation

Qi$_2$ra — **Middle to late Pleistocene river deposits, older member** - high-standing, cobbly to sandy river terrace deposits exhibiting moderate to strong clay development and calcium carbonate accumulation

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Qi$_1$r — **Middle Pleistocene river terrace deposits, undivided** - higher-standing, cobbly to sandy river terrace deposits exhibiting strong to very strong clay development and calcium carbonate accumulation

Qo$_3$r — **Early Pleistocene river terrace deposits, younger** - very high standing, old river terrace deposits, lower level

Qo$_2$r — **Early Pleistocene river terrace deposits, middle** - very high standing, old river terrace deposits, middle level

Qo$_1$r — **Early Pleistocene river terrace deposits, older** - very high standing, old river terrace deposits, upper level

Qor — **Early Pleistocene river terrace deposits, undivided** - well rounded consolidated pebble to cobble river conglomerate

Piedmont Alluvium

Qy$_c$ — **Modern stream channel deposits** - active channel deposits composed of very poorly-sorted sand, pebbles, and cobbles with some boulders to moderately-sorted sand and pebbles

Qy$_3$ — **Latest Holocene alluvium** - unconsolidated, very poorly sorted silty to cobbly low terrace and overflow channel deposits

Qyaf — **Late Holocene alluvium, active fan deposits** - active portions of young fan deposits exhibiting distributary drainage patterns

Qy$_2$ — **Late Holocene alluvium** - planar terrace deposits located along incised drainages, broad low-relief distal fan deposits onlapping onto Holocene river alluvium, and infrequently active tributary drainage deposits

Qy$_1$ — **Older Holocene alluvium** - broad, low-relief, undulating fan deposits ehxibiting widespread, shallow braided drainage patterns

Qys — **Holocene fine-grained deposits** - unconsolidated alluvium derived predominantly from basin fill deposits

Qls — **Landslide Deposits** - unsorted sediment resulting from mass down-slope movement

Qis — **fine-grained Pleistocene deposits** - older fine-grained deposits derived primarily from the Verde Formation

Qi$_3$ — **Late Pleistocene alluvial fan and terrace deposits** - weakly consolidated sandy gravel deposits with moderate soil development

Qi$_2$b — **Middle to late Pleistocene alluvial fan and terrace deposits, younger member** - weakly consolidated sandy gravel deposits with strong soil development typically inset into slightly older Qi2 and Qi2a deposits

Qi$_1$ — **Early to middle Pleistocene alluvial fan and terrace deposits** - high, moderately consolidated gravelly deposits with strong soil development

Cenozoic Basin Deposits

Tvl — **Late Miocene to Pliocene Verde Formation, lacustrine carbonate facies** - fine-grained, laminated playa and lacustrine deposits

Tvm — **Late Miocene to Pliocene Verde Formation, lacustrine marl facies** - olive green marl locally containing gypsum and minor halite

Bedrock units

Tb — **Tertiary basalt, undivided** - Tertiary basalt flows, associated cinder cones and pyroclastic rocks, intrusive basalts, and mafic rocks

Ts — **Sandstone, undivided** - Sandstone, volcanic sandstone, nonwelded tuff beds, and interbedded mudstone to cobble conglomerate

Ps — **Supai Formation** - Permian and Upper Pennsylvanian mudstone, siltstone, sandstone, limestone and dolomite

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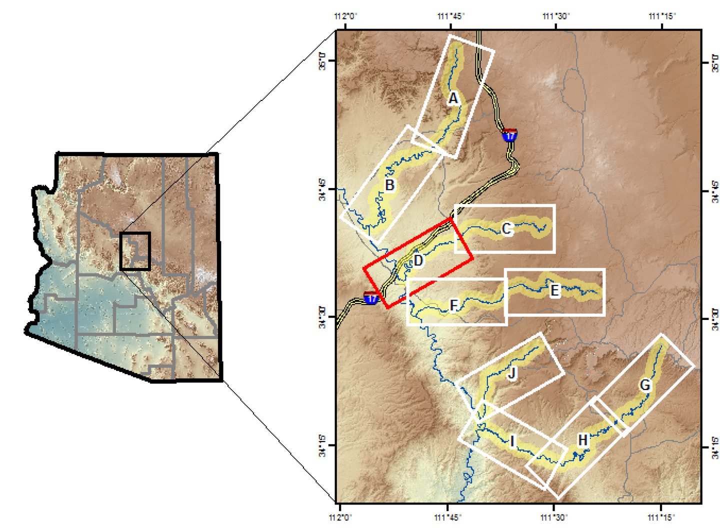

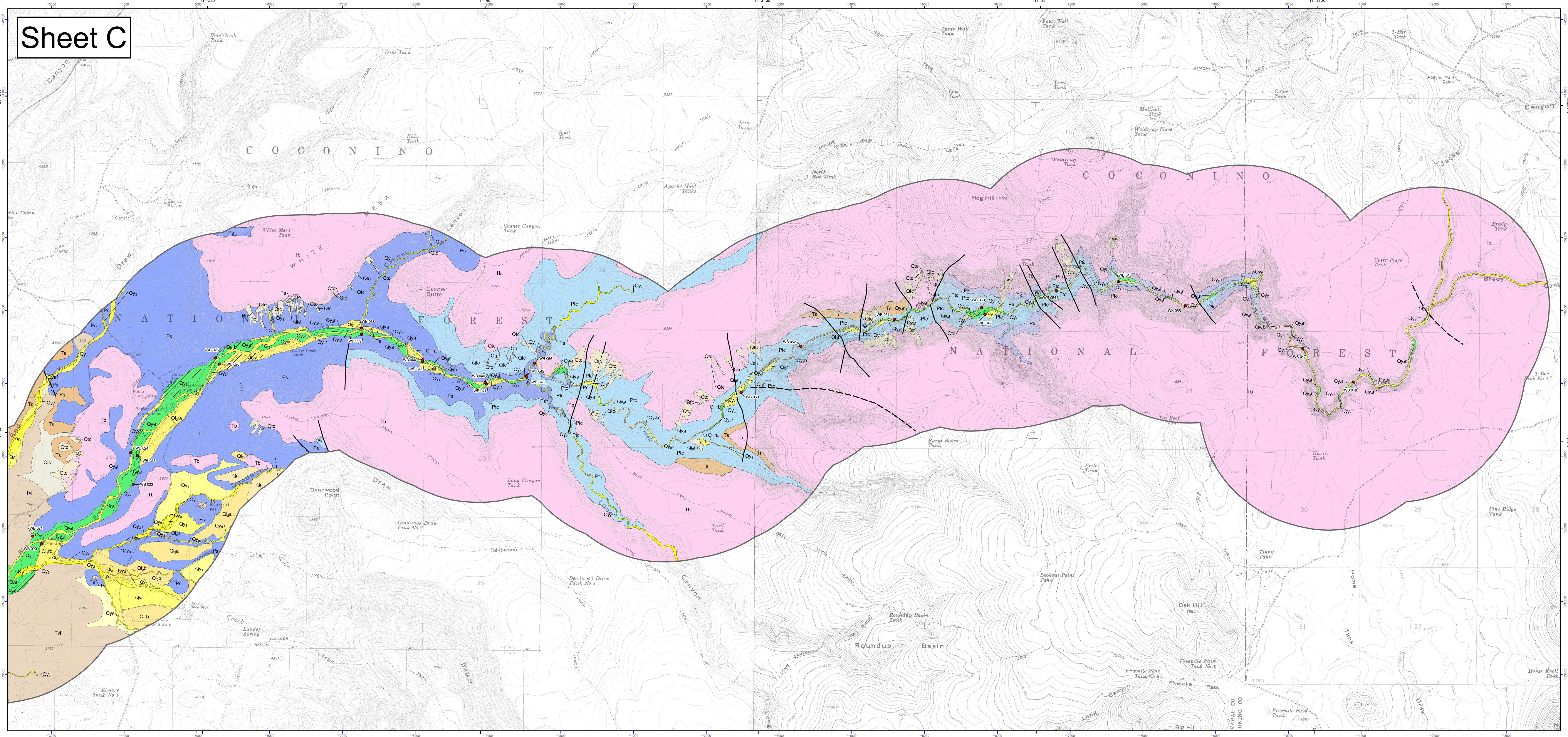

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Qy$_3$r — **Historical river terrace deposits** - unconsolidated, poorly sorted sand, gravel, silt and clay deposits on low terraces and high bars within the modern floodplain

Qy$_2$r — **Late Holocene to historical river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on terraces adjacent to the modern floodplain. Surfaces are typically planar with with tabular or lenticular gravel lenses

Qy$_1$r — **Late to early Holocene river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on slightly higher terraces adjacent to the modern floodplain. Surfaces typically are planar with local gully development

Qi$_3$rb — **Late Pleistocene river terrace deposits, younger member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel

Qi$_3$ra — **Late Pleistocene river terrace deposits, older member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel

Qi$_3$r — **Late Pleistocene river terrace deposits, undivided** - gravelly, sandy river terrace deposits 15 to 65 feet above the active river channel. Deposits consist of well rounded to rounded pebbles to cobbles with cross-bedded coarse sandy interbeds. Clast lithologies are diverse

Piedmont Alluvium

Qy$_c$ — **Modern stream channel deposits** - active channel deposits composed of very poorly-sorted sand, pebbles, and cobbles with some boulders to moderately-sorted sand and pebbles

Qy$_3$ — **Latest Holocene alluvium** - unconsolidated, very poorly sorted silty to cobbly low terrace and overflow channel deposits

Qyaf — **Late Holocene alluvium, active fan deposits** - active portions of young fan deposits exhibiting distributary drainage patterns

Qy$_2$ — **Late Holocene alluvium** - planar terrace deposits located along incised drainages, broad low-relief distal fan deposits onlapping onto Holocene river alluvium, and infrequently active tributary drainage deposits

Qy$_1$ — **Older Holocene alluvium** - broad, low-relief, undulating fan deposits ehxibiting widespread, shallow braided drainage patterns

Qys — **Holocene fine-grained deposits** - unconsolidated alluvium derived predominantly from basin fill deposits

Qls — **Landslide Deposits** - unsorted sediment resulting from mass down-slope movement (Wrucke et al., 1983)

Qi$_3$ — **Late Pleistocene alluvial fan and terrace deposits** - weakly consolidated sandy gravel deposits with moderate soil development

Qi$_2$b — **Middle to late Pleistocene alluvial fan and terrace deposits, younger member** - weakly consolidated sandy gravel deposits with strong soil development typically inset into slightly older Qi2 and Qi2a deposits

Qi$_2$a — **Middle to late Pleistocene alluvial fan and terrace deposits, older member** - weakly consolidated sandy gravel deposits with strong soil development

Qi$_2$ — **Middle to late Pleistocene alluvial fan and terrace deposits, undivided** - weakly consolidated sandy gravel deposits with strong soil development

Qi$_1$ — **Early to middle Pleistocene alluvial fan and terrace deposits** - high, moderately consolidated gravelly deposits with strong soil development

Cenozoic Basin Deposits

Tvl — **Late Miocene to Pliocene Verde Formation, lacustrine carbonate facies** - fine-grained, laminated playa and lacustrine deposits

Bedrock units

Tb — **Tertiary basalt, undivided** - Tertiary basalt flows, associated cinder cones and pyroclastic rocks, intrusive basalts, and mafic rocks

Ts — **Sandstone, undivided** - Sandstone, volcanic sandstone, nonwelded tuff beds, and interbedded mudstone to cobble conglomerate

Pk — **Kaibab Formation** - lower Permian silty to sandy dolomite, dolomitic and cherty limestone, and lenses of fine grained sandstone (Weir et al., 1989)

Ptc — **Toroweap Formation and Coconino Sandstone, undivided** - very fine to fine grained quartzose sandstone in medium to large scale crossbeds and rare horizontal beds

Ps — **Supai Formation** - Permian and Upper Pennsylvanian mudstone, siltstone, sandstone, limestone and dolomite

Bedrock and surficial geologic mapping for areas outside the lateral limits of Holocene river alluvium was compiled from the following sources

Cook, J.P., Pearthree, P.A., Onken, J. Youberg, A., Bigio, E.R., 2010, Mapping of Holocene River Alluvium along the Verde River, Central Arizona, 54 p., 10 sheets, scale 1:24,000.

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SURFICIAL GEOLOGIC MAP OF OAK CREEK, WET BEAVER CREEK, WEST CLEAR CREEK, FOSSIL CREEK, AND THE EAST VERDE RIVER, CENTRAL ARIZONA

by Cook, J.P.

October 2010

Arizona Geological Survey
Digital Map DM-RM-3C
version 1.0

Funding for this project was provided by the Arizona Department of Water Resources

USGS 24k quadrangle series topographic base maps. North American Datum of 1983. Projection and 1000-meter grid ticks (blue): Universal Transverse Mercator, zone 12.

Boundaries of Holocene River Alluvium

Thin, Solid Line — Clearly defined, accurately located contacts between Holocene river alluvium and bounding geologic units such as bedrock hillslopes, abruptly incised channels or alluvial terraces, and distinct edges of small, steep alluvial fans and talus slopes. Line location accurate to within 50 feet.

Thin, Dashed Line — Subtle or gradational contacts between Holocene river alluvium and bounding geologic units. These boundaries are often associated with very low relief distal alluvial fan onlap onto Holocene river alluvium and are often located in historically plowed fields. Line location accurate to within 100 feet.

Thin, Dotted Line — Approximately located boundary between Holocene river alluvium and bounding geologic units. Dotted line boundaries are reserved for areas which are significantly disturbed by anthropogenic activity. Placement of dotted line boundaries is based on a combination of field verification and historical aerial photo and topographic data interpretation. Line location accurate to within 500 feet depending on level of disturbance (plowed vs. paved, original topography maintained/obliterated etc.)

Other Geologic Lines

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Waypoint

Location Map

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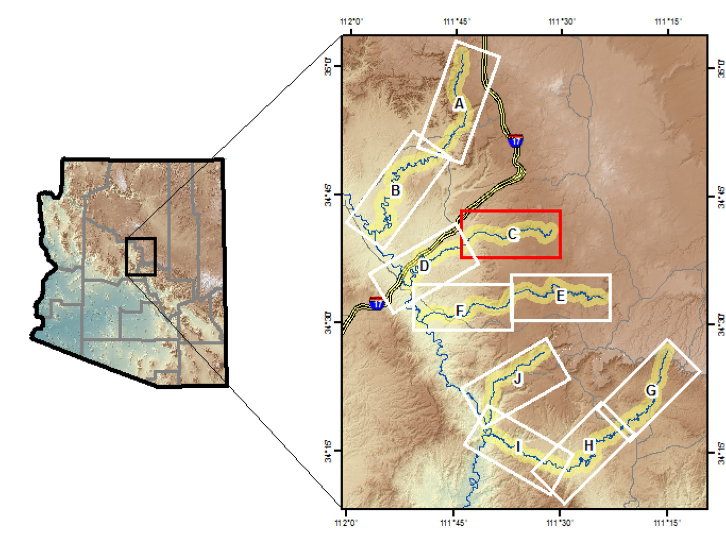

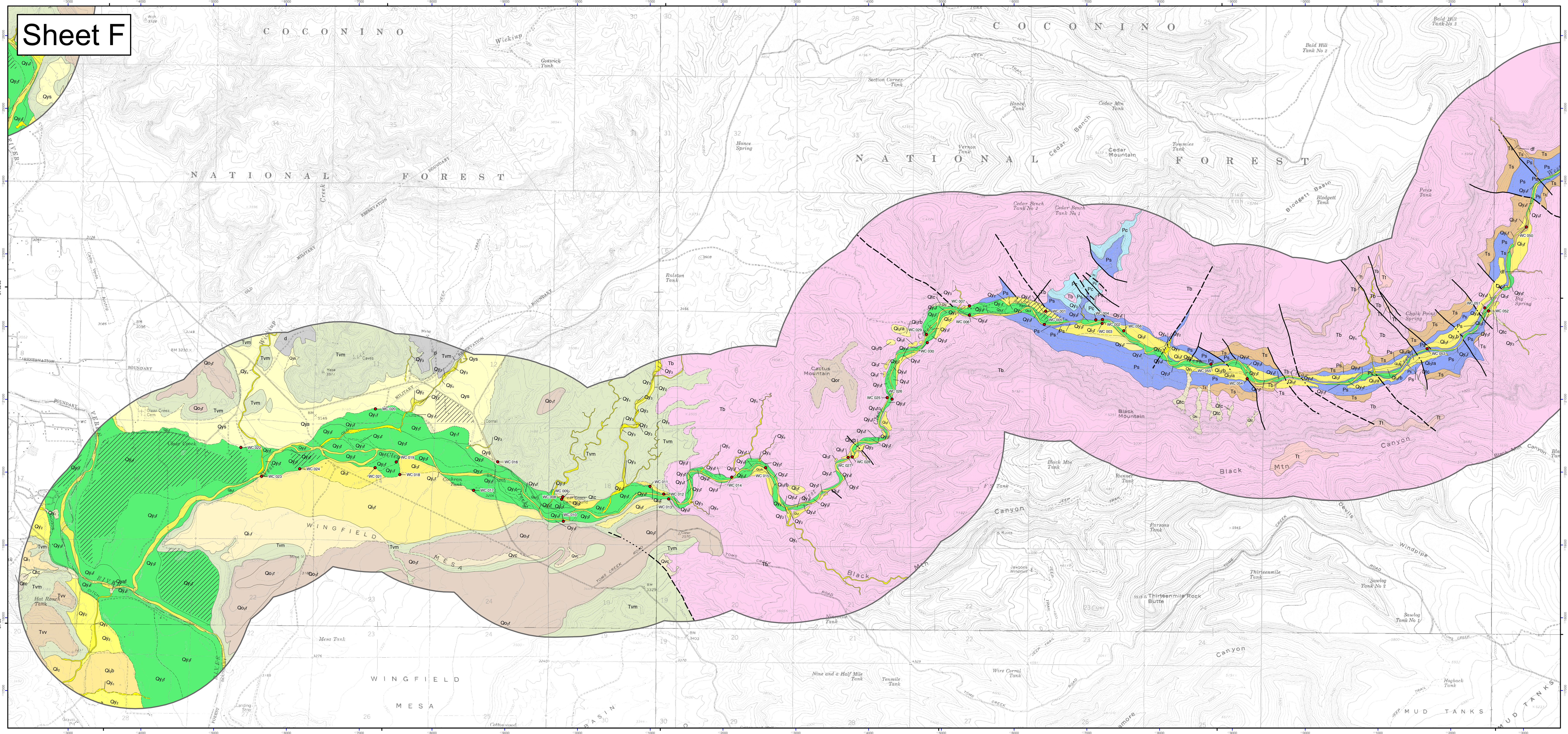

Map Unit Descriptions

Other units

- d — **Disturbed ground** - heavily disturbed ground due to agriculture, extensive excavation, mining activity, or construction of earth dams
- (hatched) — **Plowed areas** - historically or actively plowed fields, irrigated pastures, and other lightly disturbed ground
- df — **Debris flow chutes** - slope failure scars, debris flow scars, and steep debris flow and flood-scoured channels
- Qtc — **Quaternary hillslope talus and colluvium** - unconsolidated to weakly consolidated, very poorly sorted angular rock debris deposited at the base of bedrock slopes
- Qvc — **Regolith and colluvium formed on deposits of the Verde Formation** - generally fine-grained, in situ deposits mantling gentle slopes on the Verde Formation

River Alluvium

- Qy_0r — **Active river channel deposits** - unconsolidated, poorly to very poorly sorted sand to boulder deposits in active river channels. Deposits in narrow canyon reaches are very thin to discontinuous exposing underlying bedrock. Deposits are typically unvegetated to lightly vegetated and exhibit no soil development
- Qy_0b — **Bedrock lined river channel** - portions of the active channel where flow passes directly over exposed bedrock. A discontinuous layer of pebbles to boulders may be present but smooth, polished bedrock lines the channel bottom
- Qy_4r — **Flood channel and low terrace deposits** - unconsolidated sand, gravel, silt and clay deposits on bars, flood channels, and low terraces. Deposits form lightly vegetated in-channel bars, channels occupied by flow in flood events, and small planar fluvial terraces less than 4 feet above the active channel
- Qy_3r — **Historical river terrace deposits** - unconsolidated, poorly sorted sand, gravel, silt and clay deposits on low terraces and high bars within the modern floodplain
- Qy_2r — **Late Holocene to historical river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on terraces adjacent to the modern floodplain. Surfaces are typically planar with with tabular or lenticular gravel lenses
- Qy_1r — **Late to early Holocene river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on slightly higher terraces adjacent to the modern floodplain. Surfaces typically are planar with local gully development
- Qi_3rb — **Late Pleistocene river terrace deposits, younger member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel
- Qi_3ra — **Late Pleistocene river terrace deposits, older member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel
- Qi_3r — **Late Pleistocene river terrace deposits, undivided** - gravelly, sandy river terrace deposits 15 to 65 feet above the active river channel. Deposits consist of well rounded to rounded pebbles to cobbles with cross-bedded coarse sandy interbeds. Clast lithologies are diverse
- Qi_2rb — **Middle to late Pleistocene river deposits, younger member** - high-standing, cobbly to sandy river terrace deposits exhibiting moderate to strong clay development and calcium carbonate accumulation
- Qi_1r — **Middle Pleistocene river terrace deposits, undivided** - higher-standing, cobbly to sandy river terrace deposits exhibiting strong to very strong clay development and calcium carbonate accumulation
- Qo_3r — **Early Pleistocene river terrace deposits, younger** - very high standing, old river terrace deposits, lower level
- Qo_2r — **Early Pleistocene river terrace deposits, middle** - very high standing, old river terrace deposits, middle level
- Qo_1r — **Early Pleistocene river terrace deposits, older** - very high standing, old river terrace deposits, upper level
- Qor — **Early Pleistocene river terrace deposits, undivided** - well rounded consolidated pebble to cobble river conglomerate

Piedmont Alluvium

- Qy_c — **Modern stream channel deposits** - active channel deposits composed of very poorly-sorted sand, pebbles, and cobbles with some boulders to moderately-sorted sand and pebbles
- Qy_3 — **Latest Holocene alluvium** - unconsolidated, very poorly sorted silty to cobbly low terrace and overflow channel deposits
- Qyaf — **Late Holocene alluvium, active fan deposits** - active portions of young fan deposits exhibiting distributary drainage patterns
- Qy_2 — **Late Holocene alluvium** - planar terrace deposits located along incised drainages, broad low-relief distal fan deposits onlapping onto Holocene river alluvium, and infrequently active tributary drainage deposits
- Qys — **Holocene fine-grained deposits** - unconsolidated alluvium derived predominantly from basin fill deposits
- Qis — **fine-grained Pleistocene deposits** - older fine-grained deposits derived primarily from the Verde Formation
- Qi_3 — **Late Pleistocene alluvial fan and terrace deposits** - weakly consolidated sandy gravel deposits with moderate soil development
- Qo — **Early Pleistocene alluvial fan deposits, undivided** - high, moderately consolidated gravelly deposits with strong soil development

Cenozoic Basin Deposits

- Tvm — **Late Miocene to Pliocene Verde Formation, lacustrine marl facies** - olive green marl locally containing gypsum and minor halite
- Tvv — **Interbedded gravel, lacustrine, and volcanic facies** - areas where volcanic rocks are clearly interbedded with fluvial and lacustrine facies of the Verde Formation

Bedrock units

- Tb — **Tertiary basalt, undivided** - Tertiary basalt flows, associated cinder cones and pyroclastic rocks, intrusive basalts, and mafic rocks
- Tt — **Tertiary tuff, undivided** - felsic ash flow tuff, pumice, and siliceous flows
- Ts — **Sandstone, undivided** - Sandstone, volcanic sandstone, nonwelded tuff beds, and interbedded mudstone to cobble conglomerate
- Pc — **Coconino Sandstone** - light gray to tan, fine-grained eolian, cross-bedded sandstone
- Ps — **Supai Formation** - Permian and Upper Pennsylvanian mudstone, siltstone, sandstone, limestone and dolomite

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by Cook, J.P.
October 2010
Arizona Geological Survey
Digital Map DM-RM-3F
version 1.0

Funding for this project was provided by the Arizona Department of Water Resources

USGS 24k quadrangle series topographic base maps. North American Datum of 1983. Projection and 1000-meter grid ticks (blue): Universal Transverse Mercator, zone 12.

Boundaries of Holocene River Alluvium

Thin, Solid Line – Clearly defined, accurately located contacts between Holocene river alluvium and bounding geologic units such as bedrock hillslopes, abruptly incised channels or alluvial terraces, and distinct edges of small, steep alluvial fans and talus slopes. Line location accurate to within 50 feet.

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Location Map

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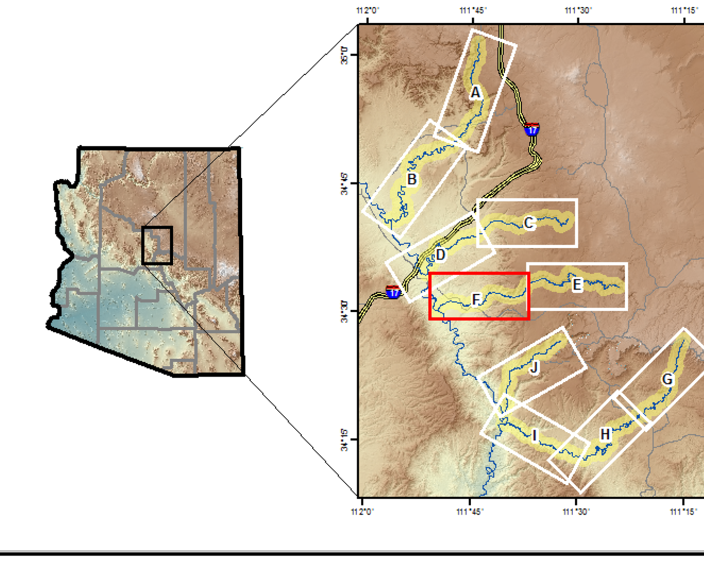

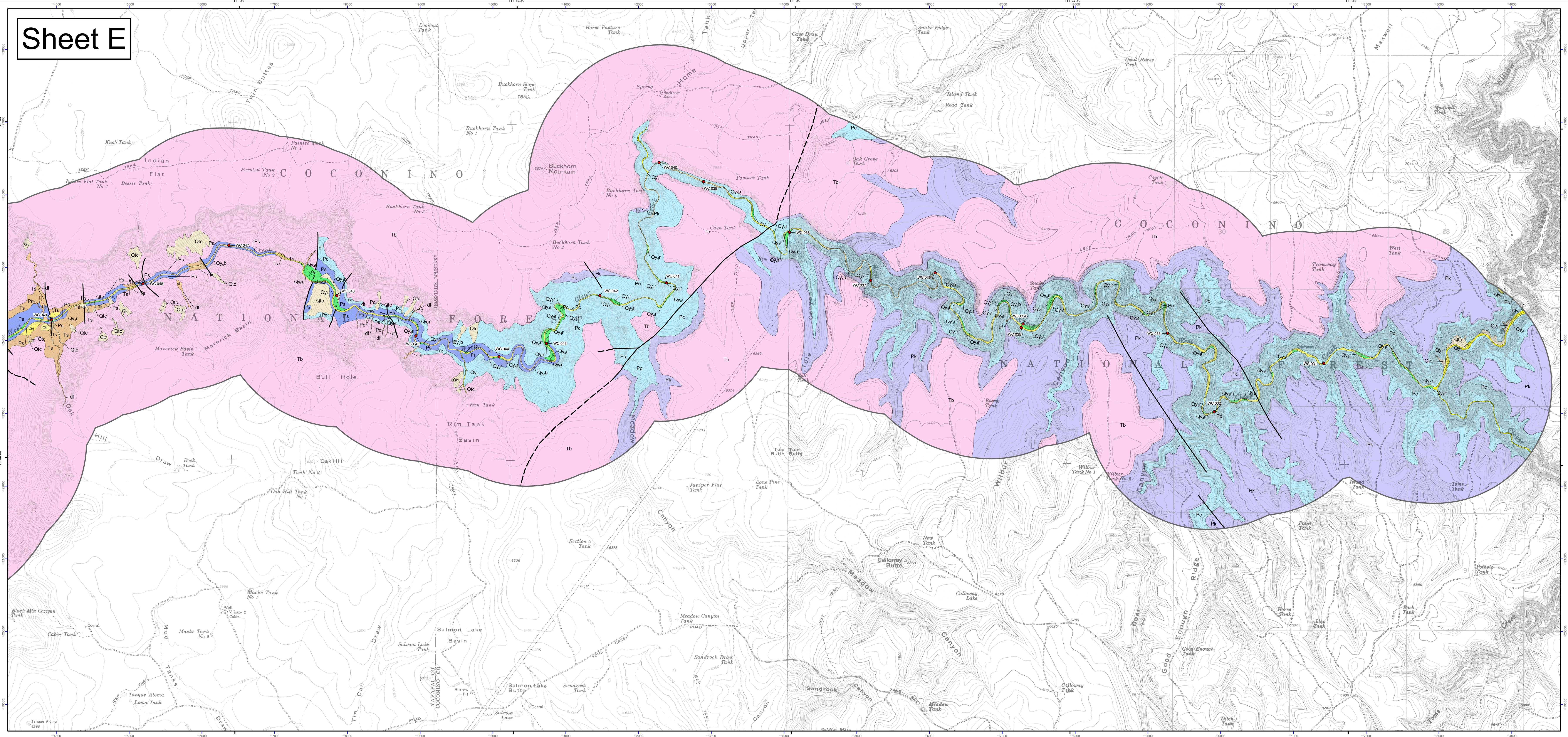

Map Unit Descriptions

Other units

- df — **Debris flow chutes** - slope failure scars, debris flow scars, and steep debris flow and flood-scoured channels
- Qtc — **Quaternary hillslope talus and colluvium** - unconsolidated to weakly consolidated, very poorly sorted angular rock debris deposited at the base of bedrock slopes

River Alluvium

- Qy_0r — **Active river channel deposits** - unconsolidated, poorly to very poorly sorted sand to boulder deposits in active river channels. Deposits in narrow canyon reaches are very thin to discontinuous exposing underlying bedrock. Deposits are typically unvegetated to lightly vegetated and exhibit no soil development
- Qy_0b — **Bedrock lined river channel** - portions of the active channel where flow passes directly over exposed bedrock. A discontinuous layer of pebbles to boulders may be present but smooth, polished bedrock lines the channel bottom
- Qy_4r — **Flood channel and low terrace deposits** - unconsolidated sand, gravel, silt and clay deposits on bars, flood channels, and low terraces. Deposits form lightly vegetated in-channel bars, channels occupied by flow in flood events, and small planar fluvial terraces less than 4 feet above the active channel
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- Qy_1r — **Late to early Holocene river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on slightly higher terraces adjacent to the modern floodplain. Surfaces typically are planar with local gully development
- Qi_3r — **Late Pleistocene river terrace deposits, undivided** - gravelly, sandy river terrace deposits 15 to 65 feet above the active river channel. Deposits consist of well rounded to rounded pebbles to cobbles with cross-bedded coarse sandy interbeds. Clast lithologies are diverse
- Qi_2r — **Middle to late Pleistocene river terrace deposits, undivided** - high-standing, cobbly to sandy river terrace deposits exhibiting moderate to strong clay development and calcium carbonate accumulation

Piedmont Alluvium

- Qy_c — **Modern stream channel deposits** - active channel deposits composed of very poorly-sorted sand, pebbles, and cobbles with some boulders to moderately-sorted sand and pebbles
- Qy_3 — **Latest Holocene alluvium** - unconsolidated, very poorly sorted silty to cobbly low terrace and overflow channel deposits

Bedrock units

- Tb — **Tertiary basalt, undivided** - Tertiary basalt flows, associated cinder cones and pyroclastic rocks, intrusive basalts, and mafic rocks
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- Pk — **Kaibab Formation** - lower Permian silty to sandy dolomite, dolomitic and cherty limestone, and lenses of fine grained sandstone (Weir et al., 1989)
- Pc — **Coconino Sandstone** - light gray to tan, fine-grained eolian, cross-bedded sandstone
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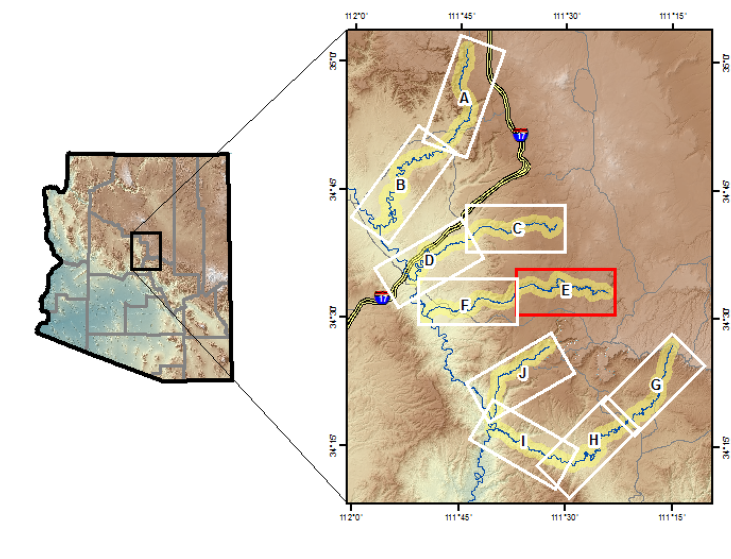

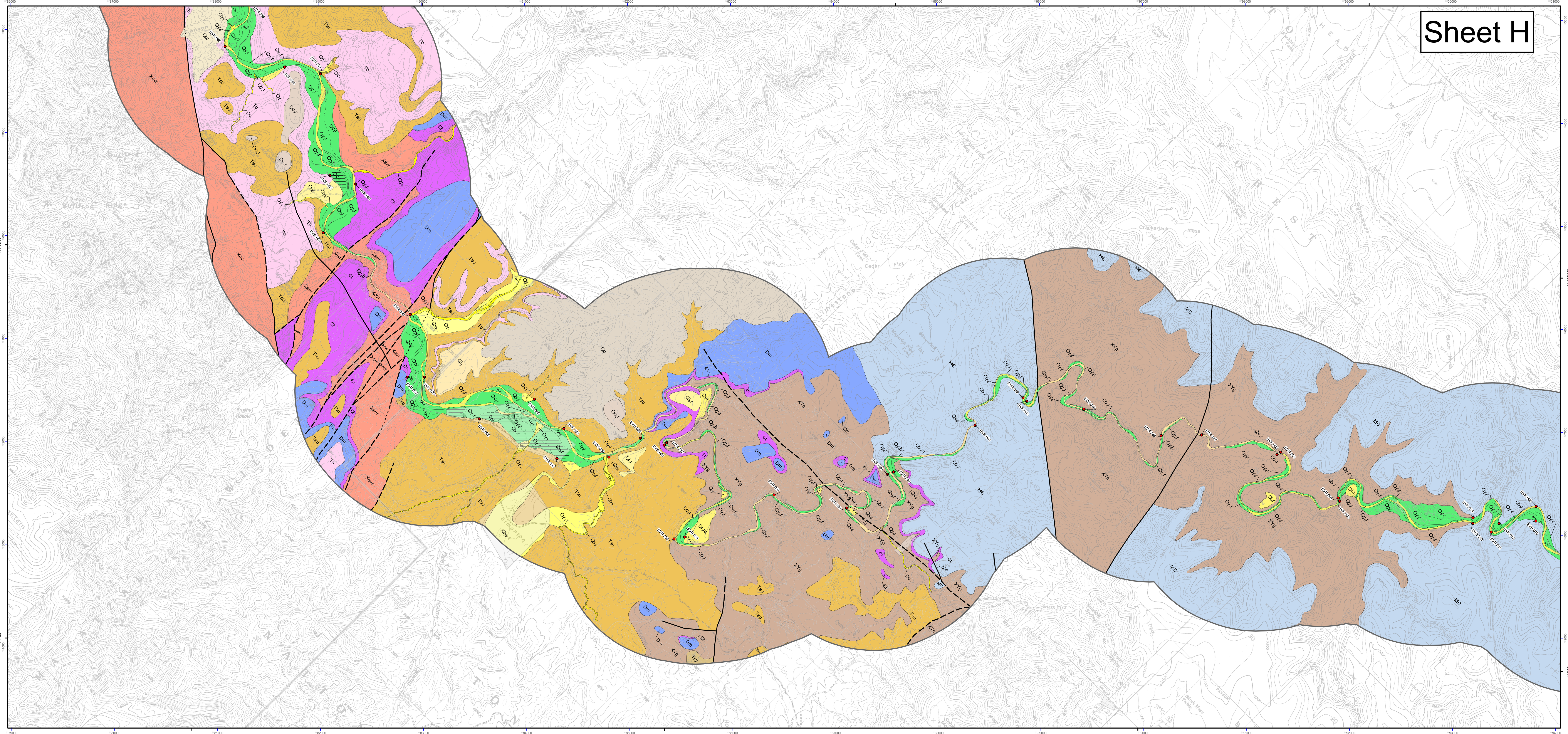

Map Unit Descriptions

Other units

- **Qtc** — **Quaternary hillslope talus and colluvium** - unconsolidated to weakly consolidated, very poorly sorted angular rock debris deposited at the base of bedrock slopes
- **(hatched)** — **Plowed areas** - historically or actively plowed fields, irrigated pastures, and other lightly disturbed ground

River Alluvium

- **Qy4r** — **Active river channel deposits** - unconsolidated, poorly to very poorly sorted sand to boulder deposits in active river channels. Deposits in narrow canyon reaches are very thin to discontinuous exposing underlying bedrock. Deposits are typically unvegetated to lightly vegetated and exhibit no soil development
- **Qy4r** — **Flood channel and low terrace deposits** - unconsolidated sand, gravel, silt and clay deposits on bars, flood channels, and low terraces. Deposits form lightly vegetated in-channel bars, channels occupied by flow in flood events, and small planar fluvial terraces less than 4 feet above the active channel
- **Qy3r** — **Historical river terrace deposits** - unconsolidated, poorly sorted sand, gravel, silt and clay deposits on low terraces and high bars within the modern floodplain
- **Qy2r** — **Late Holocene to historical river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on terraces adjacent to the modern floodplain. Surfaces are typically planar with with tabular or lenticular gravel lenses
- **Qy1r** — **Late to early Holocene river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on slightly higher terraces adjacent to the modern floodplain. Surfaces typically are planar with local gully development
- **Qi3rb** — **Late Pleistocene river terrace deposits, younger member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel
- **Qi3ra** — **Late Pleistocene river terrace deposits, older member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel
- **Qi3r** — **Late Pleistocene river terrace deposits, undivided** - gravelly, sandy river terrace deposits 15 to 65 feet above the active river channel. Deposits consist of well rounded to rounded pebbles to cobbles with cross-bedded coarse sandy interbeds. Clast lithologies are diverse.
- **Qi2r** — **Middle to late Pleistocene river terrace deposits, undivided** - high-standing, cobbly to sandy river terrace deposits exhibiting moderate to strong clay development and calcium carbonate accumulation
- **Qo3r** — **Early Pleistocene river terrace deposits, younger** - very high standing, old river terrace deposits, lower level
- **Qo2r** — **Early Pleistocene river terrace deposits, middle** - very high standing, old river terrace deposits, middle level
- **Qo1r** — **Early Pleistocene river terrace deposits, older** - very high standing, old river terrace deposits, upper level

Piedmont Alluvium

- **Qyc** — **Modern stream channel deposits** - active channel deposits composed of very poorly-sorted sand, pebbles, and cobbles with some boulders to moderately-sorted sand and pebbles
- **Qy3** — **Latest Holocene alluvium** - unconsolidated, very poorly sorted silty to cobbly low terrace and overflow channel deposits
- **Qy2** — **Late Holocene alluvium** - planar terrace deposits located along incised drainages, broad low-relief distal fan deposits onlapping onto Holocene river alluvium, and infrequently active tributary drainage deposits
- **Qy1** — **Older Holocene alluvium** - broad, low-relief, undulating fan deposits ehxibiting widespread, shallow braided drainage patterns
- **Qi1** — **Early to middle Pleistocene alluvial fan and terrace deposits** - high, moderately consolidated gravelly deposits with strong soil development
- **Qo** — **Early Pleistocene alluvial fan deposits, undivided** - high, moderately consolidated gravelly deposits with strong soil development

Cenozoic Basin Deposits

- **Tsy** — **Late Miocene to Pliocene deposits** - moderately to strongly indurated conglomerate and sandstone basin fill deposits
- **Tsu** — **Tertiary deposits, undivided** - moderately to strongly consolidated conglomerate, undivided

Bedrock units

- **Tb** — **Tertiary basalt, undivided** - Tertiary basalt flows, associated cinder cones and pyroclastic rocks, intrusive basalts, and mafic rocks
- **Dm** — **Martin Formation** - Devonian Martin Formation
- **Ꞓt** — **Tapeats Sandstone** - yellow to red, thinly bedded and crossbedded sandstone and dolomitic siltstone
- **MꞒ** — **Mississippian, Devonian, and Cambrian Sedimentary rocks, undivided** - Tapeats Sandstone, Bright Angel Shale, Muav Limestone, Temple Butte Formation, and Redwall Limestone (Richard et al., 2000)
- **Xevr** — **East Verde River Formation** - interbedded siltstone, graywacke, shale, conglomerate, mafic volcanics, felsic flows and tuff (Wrucke and Conway, 1987)
- **XYg** — **Proterozoic granite, undivided** - fine to coarse grained granitoids, quartz monzonite, porphry, rhyolite ash flows, mylonite, and granophyre

Bedrock and surficial geologic mapping for areas outside the lateral limits of Holocene river alluvium was compiled from the following sources

Richard, S.M., Reynolds, S.J., Spencer, J.E., and Pearthree, P.A., comps., 2000, Geologic Map of Arizona: Arizona Geological Survey Map M-35, 1 sheet, scale 1:1,000,000.

Wrucke, C.T., and Conway, C.M., 1987, Geologic map of the Mazatzal Wilderness and contiguous Roadless Area, Gila, Maricopa, and Yavapai Counties, Arizona: U.S. Geological Survey Open-File Report 87-0664, 22 p., 1 sheet, scale 1:48,000.

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SURFICIAL GEOLOGIC MAP OF OAK CREEK, WET BEAVER CREEK, WEST CLEAR CREEK, FOSSIL CREEK, AND THE EAST VERDE RIVER, CENTRAL ARIZONA

by Cook, J.P.

October 2010
Arizona Geological Survey
Digital Map DM-RM-3H
version 1.0

Funding for this project was provided by the Arizona Department of Water Resources

USGS 24k quadrangle series topographic base maps. North American Datum of 1983. Projection and 1000-meter grid ticks (blue): Universal Transverse Mercator, zone 12.

Boundaries of Holocene River Alluvium

Thin, Solid Line — Clearly defined, accurately located contacts between Holocene river alluvium and bounding geologic units such as bedrock hillslopes, abruptly incised channels or alluvial terraces, and distinct edges of small, steep alluvial fans and talus slopes. Line location accurate to within 50 feet.

Thin, Dashed Line — Subtle or gradational contacts between Holocene river alluvium and bounding geologic units. These boundaries are often associated with very low relief distal alluvial fan onlap onto Holocene river alluvium and are often located in historically plowed fields. Line location accurate to within 100 feet.

Thin, Dotted Line — Approximately located boundary between Holocene river alluvium and bounding geologic units. Dotted line boundaries are reserved for areas which are significantly disturbed by anthropogenic activity. Placement of dotted line boundaries is based on a combination of field verification and historical aerial photo and topographic data interpretation. Line location accurate to within 500 feet depending on level of disturbance (plowed vs. paved, original topography maintained/obliterated etc.)

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- **Hashed Line** — Gradational Contact
- **Waypoint**

Location Map

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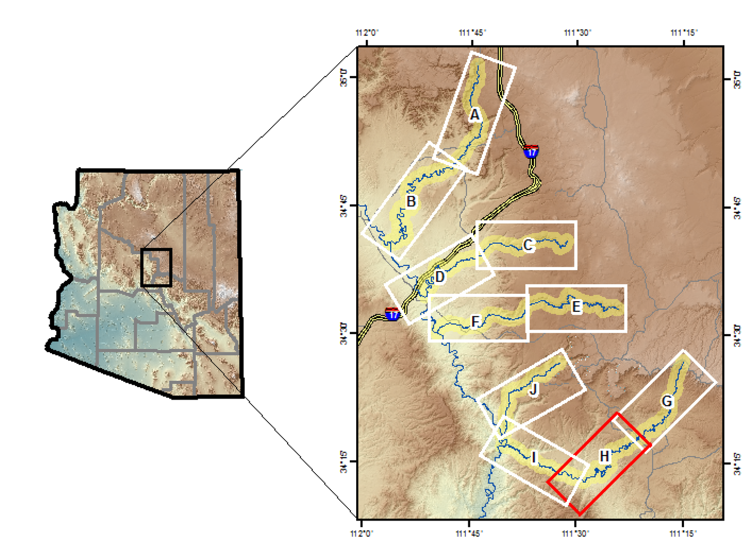

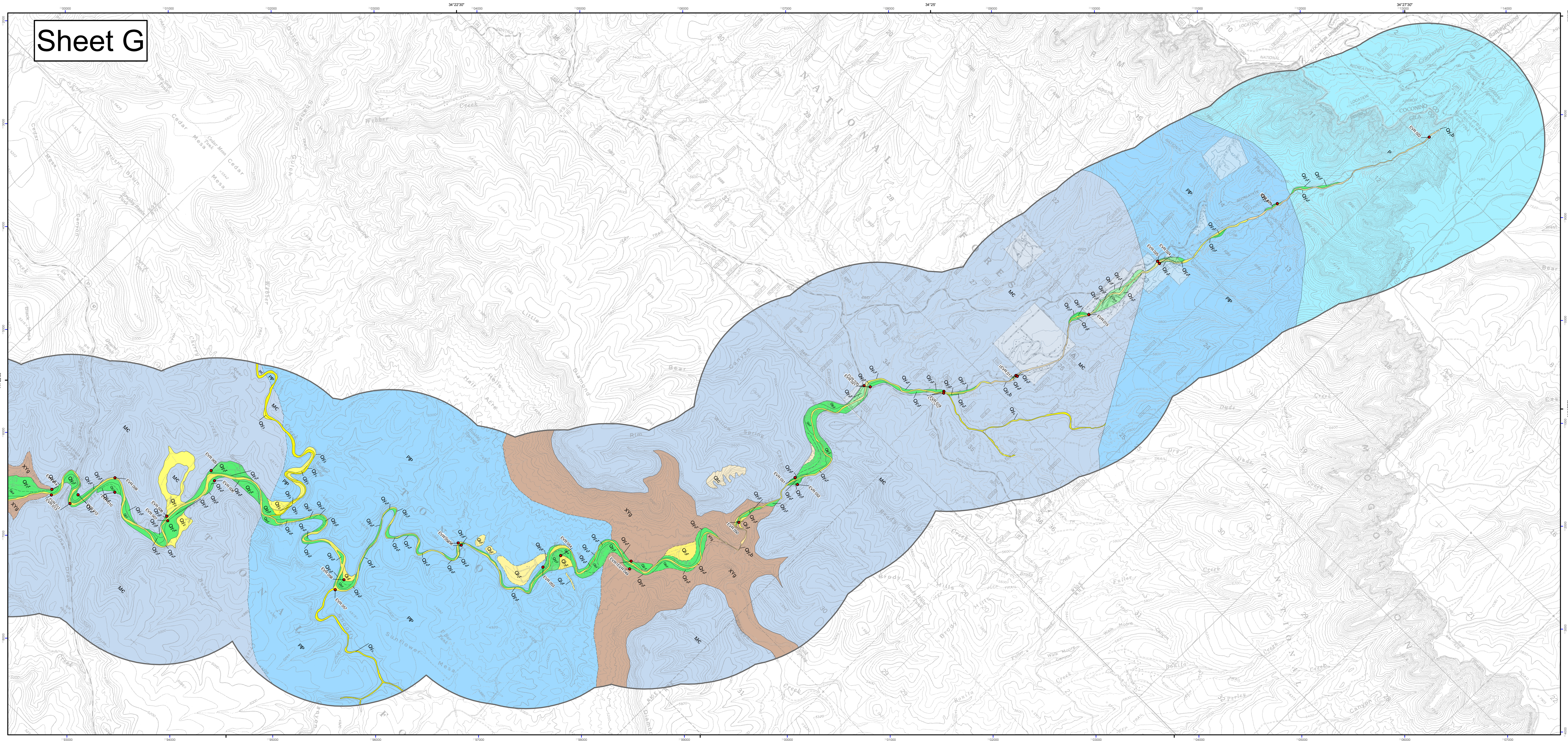

Map Unit Descriptions

Other units

- **Qtc** — **Quaternary hillslope talus and colluvium** - unconsolidated to weakly consolidated, very poorly sorted angular rock debris deposited at the base of bedrock slopes

River Alluvium

- **Qy4r** — **Active river channel deposits** - unconsolidated, poorly to very poorly sorted sand to boulder deposits in active river channels. Deposits in narrow canyon reaches are very thin to discontinuous exposing underlying bedrock. Deposits are typically unvegetated to lightly vegetated and exhibit no soil development
- **Qy4b** — **Bedrock lined river channel** - portions of the active channel where flow passes directly over exposed bedrock. A discontinuous layer of pebbles to boulders may be present but smooth, polished bedrock lines the channel bottom
- **Qy4r** — **Flood channel and low terrace deposits** - unconsolidated sand, gravel, silt and clay deposits on bars, flood channels, and low terraces. Deposits form lightly vegetated in-channel bars, channels occupied by flow in flood events, and small planar fluvial terraces less than 4 feet above the active channel
- **Qy3r** — **Historical river terrace deposits** - unconsolidated, poorly sorted sand, gravel, silt and clay deposits on low terraces and high bars within the modern floodplain
- **Qy2r** — **Late Holocene to historical river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on terraces adjacent to the modern floodplain. Surfaces are typically planar with with tabular or lenticular gravel lenses
- **Qy1r** — **Late to early Holocene river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on slightly higher terraces adjacent to the modern floodplain. Surfaces typically are planar with local gully development
- **Qi3r** — **Late Pleistocene river terrace deposits, undivided** - gravelly, sandy river terrace deposits 15 to 65 feet above the active river channel. Deposits consist of well rounded to rounded pebbles to cobbles with cross-bedded coarse sandy interbeds. Clast lithologies are diverse
- **Qi2r** — **Middle to late Pleistocene river terrace deposits, undivided** - high-standing, cobbly to sandy river terrace deposits exhibiting moderate to strong clay development and calcium carbonate accumulation

Piedmont Alluvium

- **Qyc** — **Modern stream channel deposits** - active channel deposits composed of very poorly-sorted sand, pebbles, and cobbles with some boulders to moderately-sorted sand and pebbles
- **Qy3** — **Latest Holocene alluvium** - unconsolidated, very poorly sorted silty to cobbly low terrace and overflow channel deposits
- **Qy2** — **Late Holocene alluvium** - planar terrace deposits located along incised drainages, broad low-relief distal fan deposits onlapping onto Holocene river alluvium, and infrequently active tributary drainage deposits

Bedrock units

- **P** — **Permian sedimentary rocks, undivided** - gray to tan, cherty limestone of the Kaibab and Toroweap Formations, and underlying white to tan, fine-grained Coconino Sandstone (Richard et al., 2000)
- **PIP** — **Permian to Pennsylvanian Sedimentary rocks, undivided** - interbedded sandstone, shale, and limestone from the Supai Group and Hermit Shale (Richard et al., 2000)
- **MꞒ** — **Mississippian, Devonian, and Cambrian Sedimentary rocks, undivided** - Tapeats Sandstone, Bright Angel Shale, Muav Limestone, Temple Butte Formation, and Redwall Limestone (Richard et al., 2000)
- **XYg** — **Proterozoic granite, undivided** - fine to coarse grained granitoids, quartz monzonite, porphry, rhyolite ash flows, mylonite, and granophyre

Bedrock and surficial geologic mapping for areas outside the lateral limits of Holocene river alluvium was compiled from the following sources

Richard, S.M., Reynolds, S.J., Spencer, J.E., and Pearthree, P.A., comps., 2000, Geologic Map of Arizona: Arizona Geological Survey Map M-35, 1 sheet, scale 1:1,000,000.

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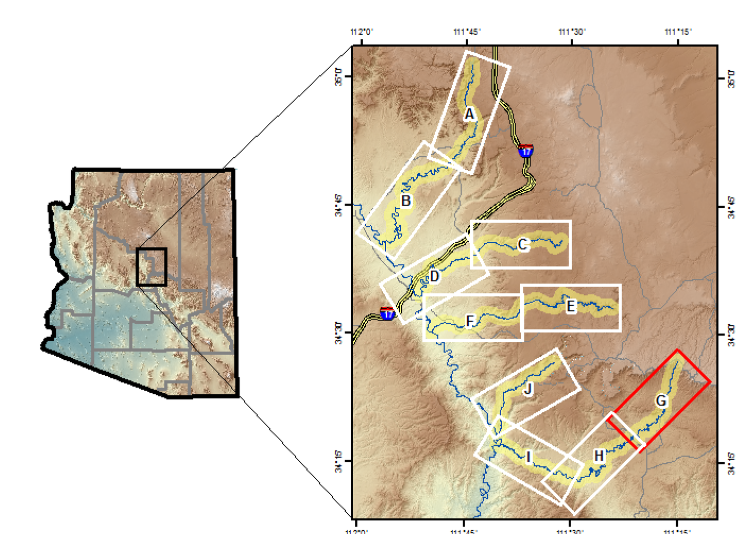

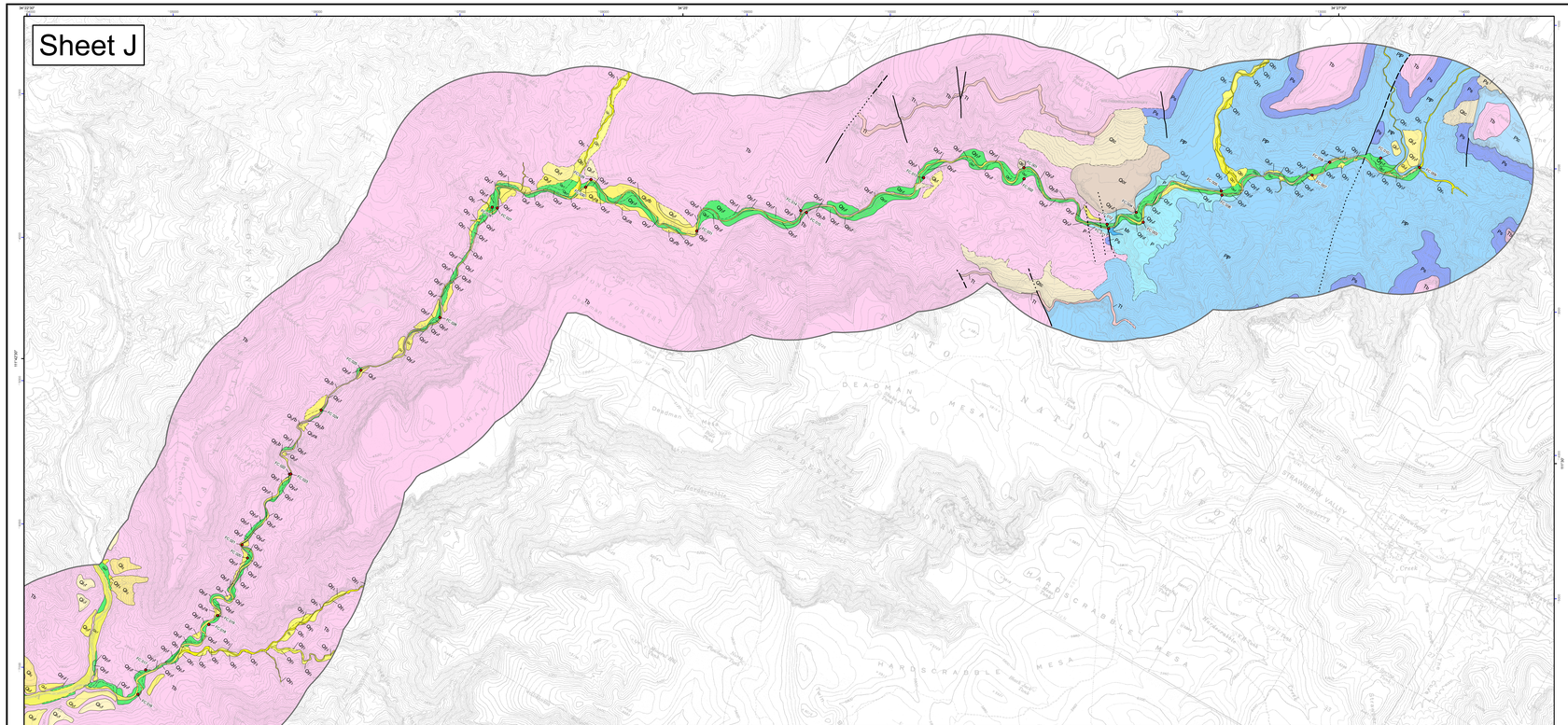

Map Unit Descriptions

Other units

Qtc — **Quaternary hillslope talus and colluvium** - unconsolidated to weakly consolidated, very poorly sorted angular rock debris deposited at the base of bedrock slopes

River Alluvium

Qyr — **Active river channel deposits** - unconsolidated, poorly to very poorly sorted sand to boulder deposits in active river channels. Deposits in narrow canyon reaches are very thin to discontinuous exposing underlying bedrock. Deposits are typically unvegetated to lightly vegetated and exhibit no soil development

Qyrb — **Bedrock lined river channel** - portions of the active channel where flow passes directly over exposed bedrock. A discontinuous layer of pebbles to boulders may be present but smooth, polished bedrock lines the channel bottom

Qyrf — **Flood channel and low terrace deposits** - unconsolidated sand, gravel, silt and clay deposits on bars, flood channels, and low terraces. Deposits form lightly vegetated in-channel bars, channels occupied by flow in flood events, and small planar fluvial terraces less than 4 feet above the active channel

Qyrt — **Historical river terrace deposits** - unconsolidated, poorly sorted sand, gravel, silt and clay deposits on low terraces and high bars within the modern floodplain

Qyrl — **Late Holocene to historical river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on terraces adjacent to the modern floodplain. Surfaces are typically planar with with tabular or lenticular gravel lenses

Qyrf — **Late to early Holocene river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on slightly higher terraces adjacent to the modern floodplain. Surfaces typically are planar with local gully development

Qyrb — **Late Pleistocene river terrace deposits, younger member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel

Qyrm — **Late Pleistocene river terrace deposits, older member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel

Qyr — **Late Pleistocene river terrace deposits, undivided** - gravelly, sandy river terrace deposits 15 to 65 feet above the active river channel. Deposits consist of well rounded to rounded pebbles to cobbles with cross-bedded coarse sandy interbeds. Clast lithologies are diverse

Qlr — **Middle to late Pleistocene river terrace deposits, undivided** - high-standing, cobbly to sandy river terrace deposits exhibiting moderate to strong clay development and calcium carbonate accumulation

Qlr — **Middle Pleistocene river terrace deposits, undivided** - higher-standing, cobbly to sandy river terrace deposits exhibiting strong to very strong clay development and calcium carbonate accumulation

Qpr — **Early Pleistocene river terrace deposits, undivided** - well rounded consolidated pebble to cobble river conglomerate

Piedmont Alluvium

Qyp — **Modern stream channel deposits** - active channel deposits composed of very poorly-sorted sand, pebbles, and cobbles with some boulders to moderately-sorted sand and pebbles

Qyp — **Latest Holocene alluvium** - unconsolidated, very poorly sorted silty to cobbly low terrace and overflow channel deposits

Qyp — **Late Holocene alluvium** - planar terrace deposits located along incised drainages, broad low-relief distal fan deposits onlapping onto Holocene river alluvium, and infrequently active tributary drainage deposits

Qop — **Older Holocene alluvium** - broad, low-relief, undulating fan deposits exhibiting widespread, shallow braided drainage patterns

Qlp — **Middle to late Pleistocene alluvial fan and terrace deposits, undivided** - weakly consolidated sandy gravel deposits with strong soil development

Bedrock units

Tb — **Tertiary basalt, undivided** - Tertiary basalt flows, associated cinder cones and pyroclastic rocks, intrusive basalts, and mafic rocks

Tt — **Tertiary tuff, undivided** - felsic ash flow tuff, pumice, and siliceous flows

Pto — **Toroweap Formation and Coconino Sandstone, undivided** - very fine to fine grained quartzose sandstone in medium to large scale crossbeds and rare horizontal beds

Ps — **Supai Formation** - Permian and Upper Pennsylvanian mudstone, siltstone, sandstone, limestone and dolomite

P — **Permian sedimentary rocks, undivided** - gray to tan, cherty limestone of the Kaibab and Toroweap Formations, and underlying white to tan, fine-grained Coconino Sandstone (Richard et al., 2000)

PIP — **Permian to Pennsylvanian Sedimentary rocks, undivided** - interbedded sandstone, shale, and limestone from the Supai Group and Hermit Shale (Richard et al., 2000)

Mr — **Redwall Limestone** - Mississippian Redwall Limestone

Bedrock and surficial geologic mapping for areas outside the lateral limits of Holocene river alluvium was compiled from the following sources

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Weir, G.W., and Beard, L.S., 1984, Geologic map of the Fossil Springs Roadless Area, Yavapai, Gila, and Coconino Counties, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1568-C, 1 sheet, scale 1:24,000.

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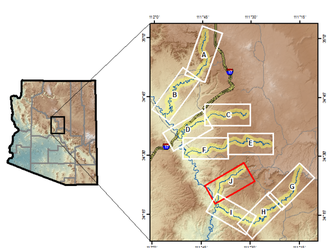

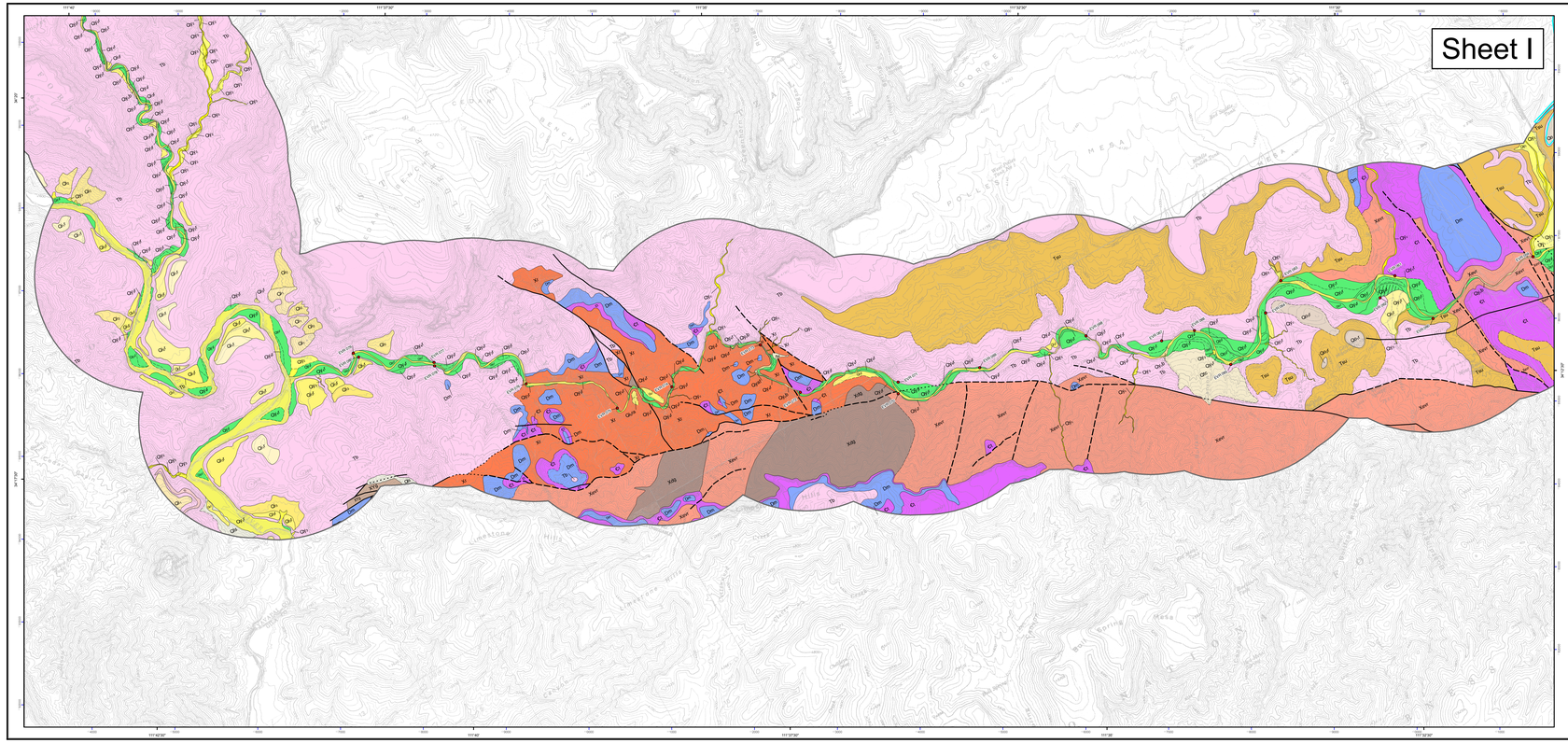

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Qyrl — **Late Holocene to historical river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on terraces adjacent to the modern floodplain. Surfaces are typically planar with with tabular or lenticular gravel lenses

Qyrf — **Late to early Holocene river terrace deposits** - unconsolidated, poorly sorted silt, sand, clay and gravel deposits on slightly higher terraces adjacent to the modern floodplain. Surfaces typically are planar with local gully development

Qyrb — **Late Pleistocene river terrace deposits, younger member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel

Qyrm — **Late Pleistocene river terrace deposits, older member** - gravelly, sandy river terrace deposits up to 65 feet above the active river channel

Qyr — **Late Pleistocene river terrace deposits, undivided** - gravelly, sandy river terrace deposits 15 to 65 feet above the active river channel. Deposits consist of well rounded to rounded pebbles to cobbles with cross-bedded coarse sandy interbeds. Clast lithologies are diverse.

Qlr — **Middle to late Pleistocene river terrace deposits, undivided** - high-standing, cobbly to sandy river terrace deposits exhibiting moderate to strong clay development and calcium carbonate accumulation

Qorr — **Early Pleistocene river terrace deposits, younger** - very high standing, old river terrace deposits, lower level

Qorr — **Early Pleistocene river terrace deposits, middle** - very high standing, old river terrace deposits, middle level

Qorr — **Early Pleistocene river terrace deposits, older** - very high standing, old river terrace deposits, upper level

Piedmont Alluvium

Qyp — **Modern stream channel deposits** - active channel deposits composed of very poorly-sorted sand, pebbles, and cobbles with some boulders to moderately-sorted sand and pebbles

Qyp — **Latest Holocene alluvium** - unconsolidated, very poorly sorted silty to cobbly low terrace and overflow channel deposits

Qyaf — **Late Holocene alluvium, active fan deposits** - active portions of young fan deposits exhibiting distributary drainage patterns

Qyp — **Late Holocene alluvium** - planar terrace deposits located along incised drainages, broad low-relief distal fan deposits onlapping onto Holocene river alluvium, and infrequently active tributary drainage deposits

Qop — **Older Holocene alluvium** - broad, low-relief, undulating fan deposits ehxibiting widespread, shallow braided drainage patterns

Qls — **Landslide Deposits** - unsorted sediment resulting from mass down-slope movement (Wrucke et al., 1983)

Qlp — **Late Pleistocene alluvial fan and terrace deposits** - weakly consolidated sandy gravel deposits with moderate soil development

Qlr — **Early to middle Pleistocene alluvial fan and terrace deposits** - high, moderately consolidated gravelly deposits with strong soil development

Qlo — **Early Pleistocene alluvial fan deposits, undivided** - high, moderately consolidated gravelly deposits with strong soil development

Cenozoic Basin Deposits

Tsu — **Tertiary deposits, undivided** - moderately to strongly consolidated conglomerate, undivided

Bedrock units

Tb — **Tertiary basalt, undivided** - Tertiary basalt flows, associated cinder cones and pyroclastic rocks, intrusive basalts, and mafic rocks

Tt — **Tertiary tuff, undivided** - felsic ash flow tuff, pumice, and siliceous flows

Dm — **Martin Formation** - Devonian Martin Formation

Ct — **Tapeats Sandstone** - yellow to red, thinly bedded and crossbedded sandstone and dolomitic siltstone

MC — **Mississippian, Devonian, and Cambrian Sedimentary rocks, undivided** - Tapeats Sandstone, Bright Angel Shale, Muav Limestone, Temple Butte Formation, and Redwall Limestone (Richard et al., 2000)

Xevr — **East Verde River Formation** - interbedded siltstone, graywackke, shale, conglomerate, mafic volcanics, felsic flows and tuff (Wrucke and Conway, 1987)

XYg — **Proterozoic granite, undivided** - fine to coarse grained granitoids, quartz monzonite, porphyry, rhyolite ash flows, mylonite, and granophyre

Xdg — **Diorite and gabbro** - early Proterozoic diorite and gabbro

Xi — **Proterozoic rhyolite, basalt, andesite, conglomerate, and ash flow tuffs, undivided** - compiled from Wrucke and Conway, 1987

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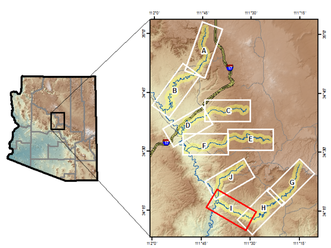
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