INTERIM GEOLOGIC MAP OF THE YELLOWJACKET CANYON QUADRANGLE, KANE COUNTY, UTAH, AND MOHAVE COUNTY, ARIZONA

by
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Description of Map Units

QUATERNARY

Alluvial deposits

Qafy **Alluvial-fan deposits** (Holocene) – Non-stratified, poorly to moderately sorted, subangular to subrounded, clay- to boulder-size sediment deposited at the mouths of active drainages; clast composition varies, reflecting rock types exposed in drainage basins upstream; primarily deposited as debris flows on active depositional surfaces; usually 10 to 30 feet (3-9 m) thick.

Qag **Alluvial-gravel deposits** (Holocene to middle Pleistocene) – Poorly to well sorted, subangular to rounded, gravel- and cobble-sized clasts locally mixed with sand and interbedded with silt and mud; deposited principally as debris flows on pediment surfaces and as higher stream-terraces and channel-fill deposits; clasts vary with source, reflecting rock types exposed in drainage basins upstream, from locally derived sandstone to transported quartzite cobbles; 0 to 150 feet (0-45 m) thick.

Artificial deposits

Qf **Artificial fill** (Historical) – Artificial fill used to create small dams; consists of engineered fill and general borrow material; although only a few deposits have been mapped, fill should be anticipated in all areas with human impact, many of which are shown on the topographic base map; 0 to 20 feet (0-6 m) thick.

Eolian deposits

Qes **Eolian sand** (Holocene to upper Pleistocene) – Well- to very well sorted, very fine to medium-grained, well-rounded, mostly quartz sand derived principally from the Navajo Sandstone and the Temple Cap Formation; commonly deposited in irregular hummocky mounds on the lee side of ridges and as sand ramps and aprons against steep-sided buttes (Sable and Doelling, 1990), primarily on the main body of the Navajo Sandstone, but also deposited on alluvial-gravel (Qag) and mixed alluvial and eolian deposits (Qae) and as sheet sand on the Co-op Creek Member of the Carmel Formation (Jcc); locally includes small dunes and outcrops of bedrock; 0 to 50 feet (0-15 m) thick.

Qed **Eolian-sand dunes** (Holocene to upper Pleistocene) – Well- to very well sorted, very fine to medium-grained, well-rounded, mostly quartz sand derived principally from the Navajo Sandstone and blown through the wind gap south of Block Mesas into dune form by strong prevailing southwesterly winds (Ford and Gillman, 2003); main dune area is about 8 miles (13 km) long and one mile (1.6 km) wide with the lower half on the downthrown block and the upper half on the upthrown block of the Sevier fault (Doelling and Davis, 1989); lower, downwind portion that includes Coral Pink Sand Dunes State Park is oriented north-northeast because northward-pinching sides of Vermilion Cliffs near Sevier fault scarp slightly alters wind direction; generally consists of an upwind succession of dune types: (1) stabilized to partially stabilized sand sheets and dunes with disjunct stands of ponderosa pine trees that reveal five periods of establishment since A.D. 1562, the age of the oldest dendrochronologically dated tree (Wilkins and others, 2005), (2) transverse dunes where ^{14}C age indicates exhumed stands of ponderosa pine with roots *in situ* in bedrock died 190 ± 50 ^{14}C yr B.P. (Wilkins and others, 2005), (3) a single star dune that formed through the merger of several smaller transverse dunes between 1960 and 1972 (Clement and others, 2006), where a sample from 3 feet (1 m) below the surface of the southern swale gave an optically-stimulated luminescence (OSL) age of 710 ± 160 OSL yr B.P., suggesting current eolian activity at surface is not reworking deeper, older sands (Wilkins and others, 2005), and (4) barchanoid ridges; includes small outcrops of bedrock and areas of sheet sand and alluvial clay deposits within the dune field; 0 to 100 feet (0-30 m) thick.

Escarpment in dune area, nearly covered by climbing dunes, creates a flow expansion point with reduced transport and northeastward alignment of upper dunes (Wilkins and Ford, 2007); upper portion that is part of the Moquith Mountains Wilderness Study Area administered by the Bureau of Land Management consists of parabolic dunes, some rising 45 feet (13 m) above the surface of non-dune sand, flanked by longitudinal dunes (Doelling and Davis, 1989); dune activity responds to relatively slight changes in climate and the resulting moisture availability, which affects vegetation and sediment supply; basal mud 28 inches (70 cm) below the surface of exhumed clay-capped eolian mesa exhumed by passing dunes dated to 470 ± 50 ^{14}C yr B.P. and had an OSL age of 0.51 ± 0.06 OSL ka (A.D. 1435-1555), indicating that the mud was deposited at a time of increased moisture near the beginning of the Little Ice Age; two additional OSL samples from separate eolian layers 6.5 feet (2 m) and 9.2 feet (2.8 m) below the clay had ages of 2.8 ± 0.22 OSL ka (1015-525 B.C.) and 4.1 ± 0.19 OSL ka (2205-1905 B.C.) (Wilkins and others, 2005); ground-penetrating radar (GPR) imagery identified additional buried bounding surfaces that cause reduced penetration whereas penetration in active dune areas was greater than 65 feet (20 m) (Wilkins and others, 2005); nearest neighbor analysis reveals that since 1960 the upper portion dunes have shifted toward a more clustered state while the lower portion dunes have become slightly less clustered, although their average crest length has increased because of smaller migrating dunes merging, and that the mathematical center of the dune field has shifted 4900 feet (1500 m) to the northeast, from which Wilkins and Ford (2007) concluded that the system is currently adjusting to an earlier sediment influx from a drier period (1931 to 1961) that is presently working its way through the system now that sediment supply is more limited by vegetation encroachment that has at least partially stabilized the southern end of the lower dunes.

Mass-movement deposits

Qmt **Talus** (Holocene to upper Pleistocene) – Very poorly sorted, angular boulders with minor fine-grained interstitial sediment; deposited mostly by rock fall on and at the base of steep slopes; form primarily from blocks that weather from the Navajo and Kayenta Formations and come to rest on the more gentle slope of the Moenave Formation; locally contains small landslide and slump deposits; may include and is gradational with older alluvium and eolian pediment-mantle deposits (Qape) farther downslope; 0 to 20 feet (0-6 m) thick.

Mixed-environment deposits

Qac, Qaco

Mixed alluvial and colluvial deposits (Holocene to upper Pleistocene) – Poorly to moderately sorted, clay- to boulder-sized, locally derived sediment deposited in swales and minor active drainages by alluvial, slope-wash, and creep processes; gradational with mixed alluvium and eolian pediment-mantle (Qape) and mixed alluvial and eolian (Qae) deposits; older deposits (Qaco), which are mapped in Sethys Canyon in the northwest and several canyons along the east edge of the quadrangle, are being dissected by and are currently 10 to 50 feet (3-15 m) above modern drainages; 0 to 30 feet (0-9 m) thick.

Qae **Mixed alluvial and eolian deposits** (Holocene to upper Pleistocene) – Moderately to well-sorted, clay- to sand-sized alluvial sediment that locally includes abundant eolian sand and minor alluvial gravel; includes alluvial-fan deposits too small to map separately in the upper part; calcic soils exhibit stage II pedogenic carbonate development (Birkeland and others, 1991); upper reaches accumulate sediment; deposits in this quadrangle are not nearly as incised as those deeply incised by Kanab Creek to the east, thus older depositional phases are not exposed; however, six samples taken from incised walls of Kanab Creek, in the adjacent Kanab quadrangle at $37^{o}03'40.31''$ N., $112^{o}32'21.86''$ W., yielded radiocarbon ages that ranged from 5345 ± 90 ^{14}C yr B.P. (5934-6291 cal yr B.P.) taken from 17 feet (5 m) above creek level to 570 ± 70 ^{14}C yr B.P. (508-664 cal yr B.P.) taken from 82 feet (25 m) above the creek level (Smith, 1990); optically stimulated luminescence (OSL) ages obtained from two samples taken from additional locations along the incised walls of Kanab Creek are much older: a sample from $37^{o}03.91'$ N., $112^{o}32.51'$ W., 80 feet (25 m) below the valley surface yet 3 feet (1 m) above Kanab Creek, yielded an age of 8580 ± 510 yr B.P., and a sample from $37^{o}02.51'$ N., $112^{o}32.13'$ W., farther downstream, 40 feet (12 m) below the valley surface yet 20 feet (6 m) above Kanab Creek, yielded an age of 11,240 ± 840 yr B.P. (Hayden, 2006), thus revealing evidence of prior cutting and filling events; mapped in the southwest corner of the quadrangle, along the valley west of Coral Pink Sand Dunes State Park, and in the northeast and northwest corners of the quadrangle on broad, nearly flat areas of Navajo Sandstone and the Co-op Creek Member of the Carmel Formation; exposed thickness 0 to 30 feet (0-9 m) thick.

Qea **Mixed eolian and alluvial deposits** (Holocene to upper Pleistocene) – Moderately to well-sorted, fine- to medium-grained eolian sand partially reworked by alluvial processes; includes some poorly to moderately sorted gravel to mud deposited in minor channels; 0 to 20 feet (0-6 m) thick.

Qape **Mixed alluvium and eolian pediment-mantle deposits** (Holocene to upper Pleistocene) – Unconsolidated to weakly consolidated clay- to small boulder-size debris that forms a pediment mantle, commonly with a thin cover of eolian sand and loess, principally on broad planar surfaces cut across the non-resistant Petrified Forest Member of the Chinle Formation, but also on the Dinosaur Canyon Member of the Moenave Formation at the base of the Vermilion Cliffs; extends into valleys from the southeast corner of the quadrangle from the base of the Vermilion Cliffs; part next to cliffs still receives sediment and locally includes small, poorly sorted alluvial-fan, slope-wash, and minor talus deposits; dissected and left as isolated remnants up to 60 feet (18 m) above modern drainages; lower end merges with mixed alluvial and eolian (Qae) deposits just off of the quadrangle; important local source of sand and gravel; 0 to 20 feet (0-6 m) thick.

unconformity

JURASSIC
Carmel Formation

Jcc **Co-op Creek Limestone Member** (Middle Jurassic) – Light-olive-gray to light-gray, thin- to medium-bedded, micritic limestone and sandy limestone interbedded with mostly light-gray, thinly laminated to thin-bedded, micritic limestone, calcareous shale, platy limestone, and very fine to fine-grained sandstone; forms ledge to small cliff near base and top with steep, ledgy slope between; sparsely vegetated; locally contains *Isocrinus* sp. crinoid columnals, pelecypods, and gastropods, especially in the upper beds (Sable and Hereford, 2004); Tang and others (2000) reported significant crinoid-bearing beds in the upper part of the unusually thick, lower limestone ledge at Mount Carmel Junction to the north; lower unconformable contact is at the base of reddish-brown to light-gray sandy siltstone that underlies the lower limestone ledge, above the massively cross-bedded, very light gray to grayish-pink sandstone of the White Throne Member of the Temple Cap Formation; Kowallis and others (2001) reported several $^{40}Ar/^{39}Ar$ ages of 168 to 167 million years old for altered volcanic ash beds, probably derived from a magmatic arc in what is now southern California and western Nevada, within the lower part of the member in southwest Utah; deposited in a shallow-marine environment (Imlay, 1980; Blakey and others, 1983); 160 to 200 feet (50-60 m) thick.

J-2 unconformity (Pipiringos and O'Sullivan, 1978), formed about 169 to 168 million years ago in southwest Utah (Kowallis and others, 2001)

Jt **Temple Cap Formation** (Middle Jurassic) – Consists of two interfingering members that are mapped as one unit because of eastward thinning of the lower member. Upper **White Throne Member** is yellowish-gray to pale-orange, very thick bedded, well-sorted, fine-grained quartz sandstone with high-angle cross-bed sets as much as 20 feet (6 m) thick; cliff forming, similar to the Navajo Sandstone but much less resistant to erosion; basal grayish-red, blocky, angular-weathering sandstone forms a ledge; deposited in coastal dune field (Blakey, 1994; Peterson, 1994). Lower **Sinawava Member** is moderate-reddish-brown mudstone, siltstone, and very fine grained, gypsiferous, silty sandstone; thins eastward; where present, it forms a prominent, narrow, vegetated slope at the top of the Navajo Sandstone; weathered reddish-brown clay particles form vertical streaks that stain the upper, "white" portion of the Navajo Sandstone; lower, unconformable contact is at the base of the moderate-reddish-brown mudstone slope, or where not present, at the break in slope, above the vertical cliff of the massively bedded, light-gray sandstone of the Navajo Sandstone; deposited in coastal-sabkha and tidal-flat environments (Blakey, 1994; Peterson, 1994); Kowallis and others (2001) reported several $^{40}Ar/^{39}Ar$ ages of 170 to 169 million years old for altered volcanic ash beds, probably derived from a magmatic arc in what is now southern California and western Nevada, within the Sinawava Member in southwest Utah; 150 to 200 feet (45-60 m) thick.

J-1 unconformity (Pipiringos and O'Sullivan, 1978), formed prior to about 170.5 million years ago in southwest Utah (Kowallis and others, 2001).

Navajo Sandstone and Kayenta Formation

Jn **Navajo Sandstone** (Lower Jurassic) – Light-gray to pale-orange in upper part and moderate-reddish-orange to moderate-reddish-brown in the lower part, massively cross-bedded, moderately well-cemented sandstone with well-rounded, fine- to medium-grained, frosted quartz sand grains; locally, ironstone bands, and concretions called "Moki marbles," are common; strongly jointed (see Rogers and Engelder, 2004; Rogers and others, 2004); forms the White Cliffs step of the Grand Staircase (Gregory, 1950); divisible into three informal units of roughly equal thickness after Doelling (2008) which are based on color and weathering tendencies; however, they are not mapped separately: (1) "white" sandstone, which forms the upper part of the Navajo Sandstone and forms the White Cliffs front of Block Mesas west of the Sevier fault, is less resistant than the "brown" sandstone at the base of the formation and is pale gray, yellowish gray, and orangish gray because of alteration, remobilization, and bleaching of limonite and hematite cement, possibly due to hydrocarbon migration (see Beitler and others, 2003); (2) "pink" sandstone forms the middle part of the Navajo Sandstone which is partially exposed across the valley as low hills and in drainages in the southwest corner of the quadrangle; it is generally the least resistant of the three units, is the most covered with eolian sand, and is pale reddish orange due to more uniformly dispersed hematite cement; and (3) "brown" or red sandstone, which forms the lower massive cliff of the Navajo Sandstone that caps the Moquith Mountains and the Vermilion Cliffs east of the Sevier fault, is streaked medium- to dark-reddish-brown because of iron oxide remobilization caused by ground-water or hydrocarbon migration; the Navajo Sandstone is the main aquifer for much of the region (Heilweil and others, 2002; Rowley and Dixon, 2004); deposited in a vast coastal and inland dune field with prevailing winds principally from the north, with rare interdunal ephemeral lakes (Blakey, 1994; Peterson, 1994); originally, much of the sand may have been carried to the area by a transcontinental river system that eroded Grenvillian-age (about 1.0 to 1.3 billion-year-old) crust that was involved in the Appalachian orogenesis of eastern North America (Dickinson and Gehrels, 2003; Rahl and others, 2003); lower contact is drawn where the massively bedded, vertically jointed sandstone gives way to the thinner bedded siltstone and sandstone of the Tenney Canyon Tongue of the Kayenta Formation; map unit includes areas of weathered sandstone regolith and Quaternary eolian sand too small to map separately; upper 1000 feet (300 m) exposed west of the Sevier fault and basal 600 feet (180 m) exposed east of the Sevier fault, thus some of the middle portion is not exposed in the quadrangle; total thickness in this area is 1800 to 2000 feet (550-600 m) (Sargent and Philpott, 1987).

Jkt **Tenney Canyon Tongue of Kayenta Formation** (Lower Jurassic) – Interbedded pale-reddish-brown siltstone, mudstone, and very fine grained, very thin bedded to laminated, quartz sandstone; ledgy slope former; deposited in a distal river, playa, and minor lacustrine environments (Tuesink, 1989; Blakey, 1994; Peterson, 1994); type section located just east of the quadrangle in what is now called Tiny Canyon (rather than Tenney Canyon) on the topographic map (Doelling, 2008); conformably lies between the Navajo Sandstone and the Lamb Point Tongue of the Navajo Sandstone with sharp upper and lower contacts; lower contact is placed where the thin, interbedded siltstone, mudstone, and sandstone above give way to the massively cross-bedded sandstone of the Lamb Point Tongue of the Navajo Sandstone; thickens westward from 200 to 250 feet (60-75 m).

Jnl **Lamb Point Tongue of the Navajo Sandstone** (Lower Jurassic) – Grayish-white to grayish-orange, very fine to fine-grained, massively cross-bedded, quartz sandstone; forms cliff; type section at Ed Lamb Point is the southern-most point of the Vermilion Cliffs that barely crosses into Arizona just east of the Sevier fault (Wilson, 1958); conformably lies between Tenney Canyon Tongue and main body of the Kayenta Formation; springs locally develop at the lower contact with the main body of the Kayenta Formation; lower contact is placed where the massively bedded, vertically jointed sandstone gives way to thinner bedded siltstone and sandstone; deposited in an eolian erg and sabkha environment (Tuesink, 1989; Blakey, 1994; Peterson, 1994); thickens northeastward across the quadrangle from 300 to 400 feet (90-120 m)

Jkm **Main body of Kayenta Formation** (Lower Jurassic) – Reddish-brown to moderate-reddish-brown to pale-red siltstone and mudstone interbedded with very fine to fine-grained sandstone; includes minor intraformational pebble conglomerate and thin beds of light-gray limestone; light-gray siltstone marker bed about 30 feet (9 m) below the top extends across the quadrangle; forms ledgy slope; deposited in distal river, playa, and minor lacustrine environments (Tuesink, 1989; Blakey, 1994; Peterson, 1994); thickness varies from 250 to 300 feet (75-90 m).

Jks **Springdale Sandstone Member of Kayenta Formation** (Lower Jurassic) – Mostly pale-reddish-purple to pale-reddish-brown, moderately sorted, fine- to medium-grained, medium- to very thick bedded sandstone, and minor, thin, discontinuous lenses of intraformational conglomerate and thin interbeds of moderate-reddish-brown or greenish-gray mudstone and siltstone; has large lenticular and wedge-shaped, low-angle, medium- to large-scale cross-bedding; secondary color banding that varies from concordant to discordant to cross-beds is common in the sandstone; cliff face broken by non-resistant layers; unconformable lower contact with the Whitmore Point Member of the Moenave Formation is placed at the base of the more massive, ledgy sandstone beds above the slope of interbedded mudstone and claystone; contains locally abundant petrified and carbonized fossil plant remains; deposited in braided-stream and minor floodplain environments (Clemmensen and others, 1989; Blakley, 1994; Peterson, 1994; and DeCourten, 1998); generally thickens eastward but locally thickens and thins abruptly; from 100 to 150 feet (30-45 m) thick.

unconformity, J-sub Kayenta of Blakey (1994) and Marzolf (1994), who proposed a major regional unconformity at the base of the Springdale Sandstone, thus restricting the Moenave Formation to the Dinosaur Canyon and Whitmore Point Members. Subsequent work by Lucas and Heckert (2001), Molina-Garza and others (2003), and Lucas and Tanner (2007a) also suggested that the Springdale Sandstone is more closely related to, and should be made the basal member of, the Kayenta Formation.

JURASSIC/TRIASSIC

Moenave Formation

Jmw **Whitmore Point Member** (Lower Jurassic) – Interbedded, pale-reddish-brown, greenish-gray, and grayish-red mudstone and claystone, with thin-bedded, moderate-reddish-brown, very fine to fine-grained sandstone and siltstone; siltstone is commonly thin bedded to laminated in lenticular or wedge-shaped beds; claystone is generally flat bedded; contains several 2- to 6-inch-thick (5-15 cm), bioturbated, cherty, very light gray to yellowish-gray, dolomitic limestone beds with algal structures, some altered to jasper, and fossil fish scales, possibly of *Semionotus kanabensis*; forms poorly exposed ledgy slope; lower, conformable contact is placed at a pronounced break in slope at the base of the lowest light-gray, thin-bedded, dolomitic limestone and above the thicker bedded sandstone and siltstone ledges of the Dinosaur Canyon Member; deposited in low-energy lacustrine and fluvial environments (Clemmensen and others, 1989; Blakey, 1994; Peterson, 1994; DeCourten, 1998; Milner and Kirkland, 2006); thickens to the west from 40 to 80 feet (12-24 m).

JTRmd **Dinosaur Canyon Member** (Lower Jurassic to Upper Triassic) – Uniformly colored, interbedded, generally thin-bedded, moderate-reddish-brown to moderate-reddish-orange, very fine to fine-grained sandstone, very fine grained silty sandstone, and lesser siltstone and mudstone; ripple marks and mud cracks common; forms ledgy slope; forms the base of Vermilion Cliffs step of the Grand Staircase (Gregory, 1950); regionally, a thin chert pebble conglomerate marks the base of the unit and the unconformity, but in this area, it is more common to have a 1.5- to 2-foot (0.5-0.6 m) thick gypsum bed with local chert pebbles; unconformable lower contact is placed at the base of the chert pebble conglomerate or gypsum bed where recognized, otherwise, it is placed at the prominent color and lithologic change from reddish-brown siltstone above to pale-greenish-gray mudstone of the Petrified Forest Member of the Chinle Formation below; deposited on broad, low floodplain that was locally shallowly flooded (fluvial mud flat) (Clemmensen and others, 1989; Blakey, 1994; Peterson, 1994; DeCourten, 1998); 200 to 250 feet (60-75 m) thick.

unconformity, J-0 of Pipiringos and O'Sullivan (1978), who thought it was at the Jurassic-Triassic boundary; however, the Jurassic-Triassic boundary is now considered to be within the Dinosaur Canyon Member of the Moenave Formation, thus the "J-0" unconformity is in Upper Triassic strata (Molina-Garza and others, 2003; Kirkland and Milner, 2006; Lucas and Tanner, 2007b).

TRIASSIC

Chinle Formation

TRcp **Petrified Forest Member** (Upper Triassic) – Highly variegated, light-brownish-gray, pale-greenish-gray, to grayish-purple bentonitic shale, mudstone, siltstone, and claystone, with lesser thick-bedded, resistant sandstone and pebble to small cobble conglomerate near base; clasts are primarily chert and quartzite; contains minor chert, nodular limestone, and very thin coal seams and lenses as much as 0.5 inch (1 cm) thick; mudstone weathers to a "popcorn" surface due to expansive clays and causes road and building foundation problems; contains locally abundant, brightly colored fossilized wood; weathers to badland topography; prone to landsliding along steep hillsides, however, most outcrops within this quadrangle have low relief; mostly slope forming; lower contact is not exposed; deposited in lacustrine, floodplain, and fluvial environments (Stewart and others, 1972; Dubiel, 1994); mapped in the southeast corner of the quadrangle; underlies mixed alluvial-pediment-eolian (Qape), older alluvial-colluvial (Qaco), and alluvial-colluvial (Qac) deposits; incomplete thickness is 150 feet (45 m).

Subsurface Unit

MzPzu Mesozoic-Paleozoic, undivided – shown on cross section only.

Sevier Fault Zone

The approximately 300-mile (480 km) long Sevier fault zone extends from about 35 miles (56 km) south of the Grand Canyon in Arizona northward to central Utah (Doelling and Davis, 1989). It has been divided into four sections, as reported by Lund and others (2008), with part of the 50-mile (80 km) long Northern Toroweap section cutting through the Yellowjacket Canyon quadrangle. The section boundary, which is also considered a probable seismogenic segment boundary, between this Northern Toroweap section and the Sevier section to the north is just north of the quadrangle at Clay Flat. Within the Sevier section, the Sevier fault has displaced Quaternary volcanic rocks at Black Mountain and Red Canyon; however, no historical earthquakes have ruptured the surface (Lund and others, 2008). Lund and others (2008) reported that the fault has a vertical slip rate of less than 0.1 mm per year and a recurrence interval of greater than 30,000 years between surface faulting earthquakes. Existing paleoseismic information is summarized in Hecker (1993) and Black and others (2003). Although there are no fault scarps in unconsolidated deposits, historical seismicity from 1959 to 2004, detailed by Brumbaugh (2008), defines a band of activity extending through the area. The largest earthquake during this time period had an epicenter within the Yellowjacket Canyon quadrangle, and was M_L 4.4 on February 12, 1962 at latitude 36°06'50" N. and longitude 112°42'40" W. (Brumbaugh, 2008). The fault zone of overlapping and anastomosing strands reaches widths of about 0.5 mile (1 km) (Lund and others, 2008). Anderson and Christensen (1989) reported left-lateral oblique slip south of Clay Flat. Movement along the Sevier fault probably began 15 to 12 million years ago (Davis, 1999).

Within the Yellowjacket Canyon quadrangle, the generally north to north-northeastward striking faults that constitute the fault zone are high-angle normal faults, usually with down-to-the-west displacement. Blocks between these faults are sometimes moderately tilted to perhaps

40^{o}, as near the center of the quadrangle, north of the sand dunes (Qed) at the drainage divide between Yellowjacket Canyon flowing north and Sand Canyon Wash flowing south. Displacement near the south edge of the quadrangle is approximately 1600 feet (500 m), with the least resistant middle portion of the Navajo Sandstone on the downthrown block juxtaposed with the Dinosaur Canyon Member of the Moenave Formation on the upthrown block at the base of the Vermilion Cliffs, which are capped by the most resistant basal portion of the Navajo Sandstone. At this location, the fault zone is at its widest and the escarpment, more than 1000 feet (300 m) tall, is at its maximum height. The Vermilion Cliffs gradually disappear to the north until only the capping Navajo Sandstone is exposed along the 350-foot (100 m) high escarpment at the sand dunes, where climbing sand dunes all but cover it. North of the dunes and eolian sand deposits, the Sevier fault is a series of simple right-stepping faults expressed as a 200-foot (60 m) cliff of Navajo Sandstone. Along the north edge of the quadrangle, the fault zone widens again as various splays of the fault diverge to accommodate the large westward step-over of the fault near the segment boundary at Clay Flat north of the quadrangle (Hayden, 2008).

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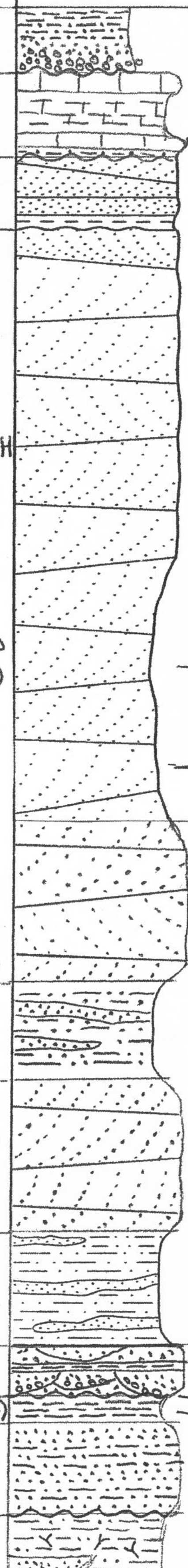
LITHOLOGIC COLUMN
Yellowjacket Canyon Quadrangle

ERATHEM	SYSTEM	SERIES	MAP UNIT FORMATION-MEMBER	MAP SYMBOL	THICKNESS Feet (Meters)	LITHOLOGY
CENOZOIC	QUAT.	Holo-Pleis	surficial deposits	Various Q	0-150 (0-45)	
MESOZOIC	JURASSIC	Middle	Carmel Formation – Co-op Creek Limestone Member	Jcc	160-200 (50-60)	Isocrinus sp.
			Temple Cap Formation	Jt	150-200 (45-60)	J-2 unconformity; White Throne Member; Sinawava Member; J-1 unconformity
		Lower	Navajo Sandstone	Jn	Upper 1000+ (300+) exposed west of Sevier fault; 1800-2000 (550-600) total; Lower 600+ (180+) exposed east of Sevier Fault	Less resistant "white" sandstone; Massive cross-bedding; Least resistant "pink" sandstone; SECTION NOT EXPOSED; Most resistant "brown" sandstone
			Tenney Canyon Tongue of Kayenta Formation	Jkt	200-250 (60-75)	
			Lamb Point Tongue of Navajo Sandstone	Jnl	300-400 (90-120)	colored sands
			Kayenta Formation – main body	Jkm	250-300 (75-90)	
			Kayenta Formation – Springdale Sandstone Member	Jks	100-150 (30-45)	Petrified wood; J-sub Kayenta unconformity
			Moenave Formation – Whitmore Pt. Mbr.	Jmw	40-80 (12-24)	Semionotus kanabensis (fish scales)
			Moenave Formation – Dinosaur Canyon Member	JTRmd	200-250 (60-75)	J-0 unconformity
	TRIASSIC	Upper	Chinle Formation – Petrified Forest Member	TRcp	150+ (45+)	Swelling clays; Petrified wood



EXPLANATION

Contact

High-angle normal fault – Dashed where approximately located, dotted where concealed; bar and ball on downthrown side

6000 / 6000 — Structural contours – Red contours drawn on top of Navajo Sandstone (Jn); purple contours drawn on top of the Tenney Canyon Tongue of Kayenta Formation (Jkt); dashed where projected; units are in feet above sea level. Contour interval 100 feet

A——A' Line of cross section

2 Strike and dip of bedding

Joint, near vertical

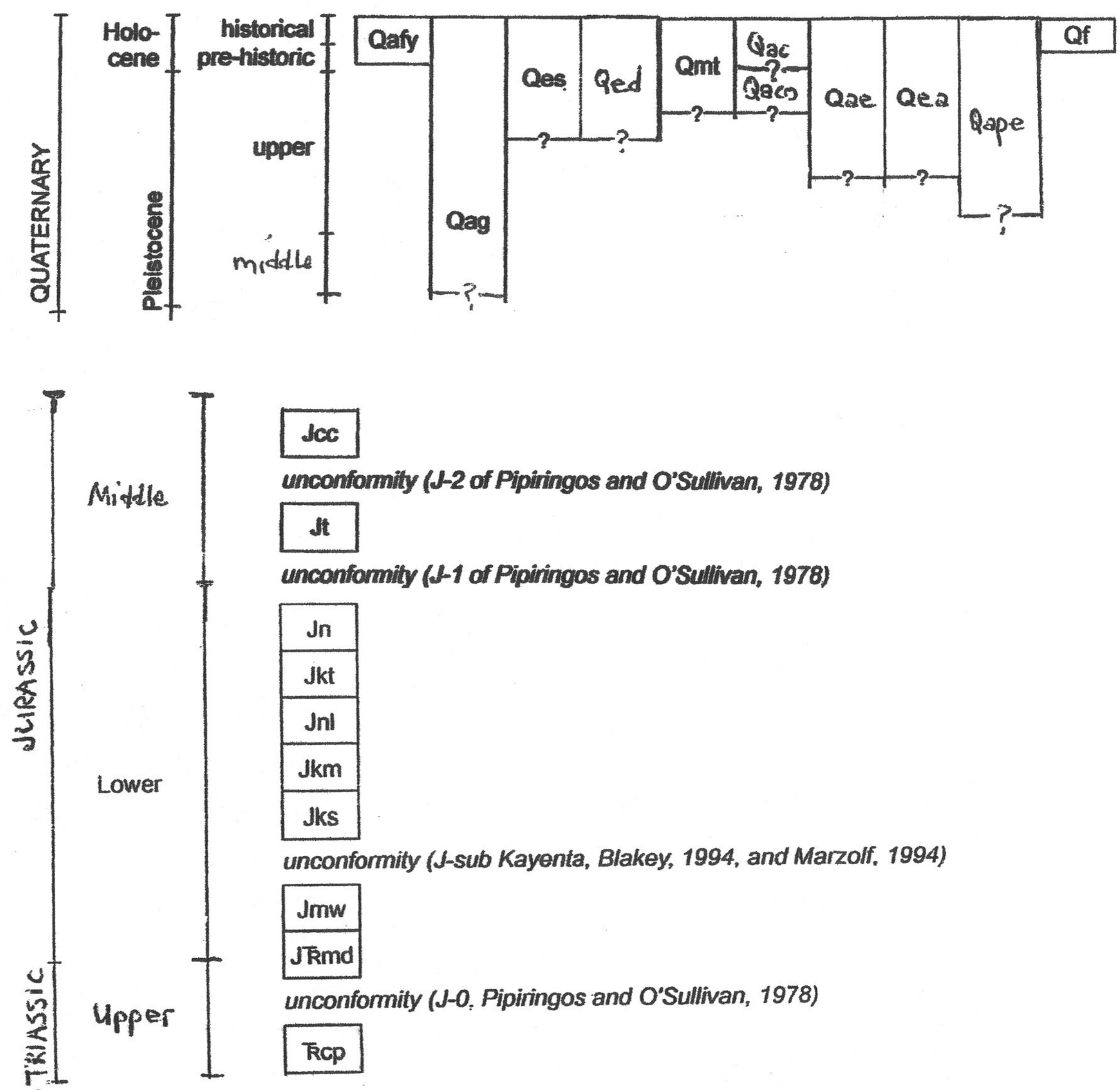
Quarry (limestone)

Gravel pit

Spring

Oil exploration well – Plugged and abandoned

CORRELATION OF MAP UNITS



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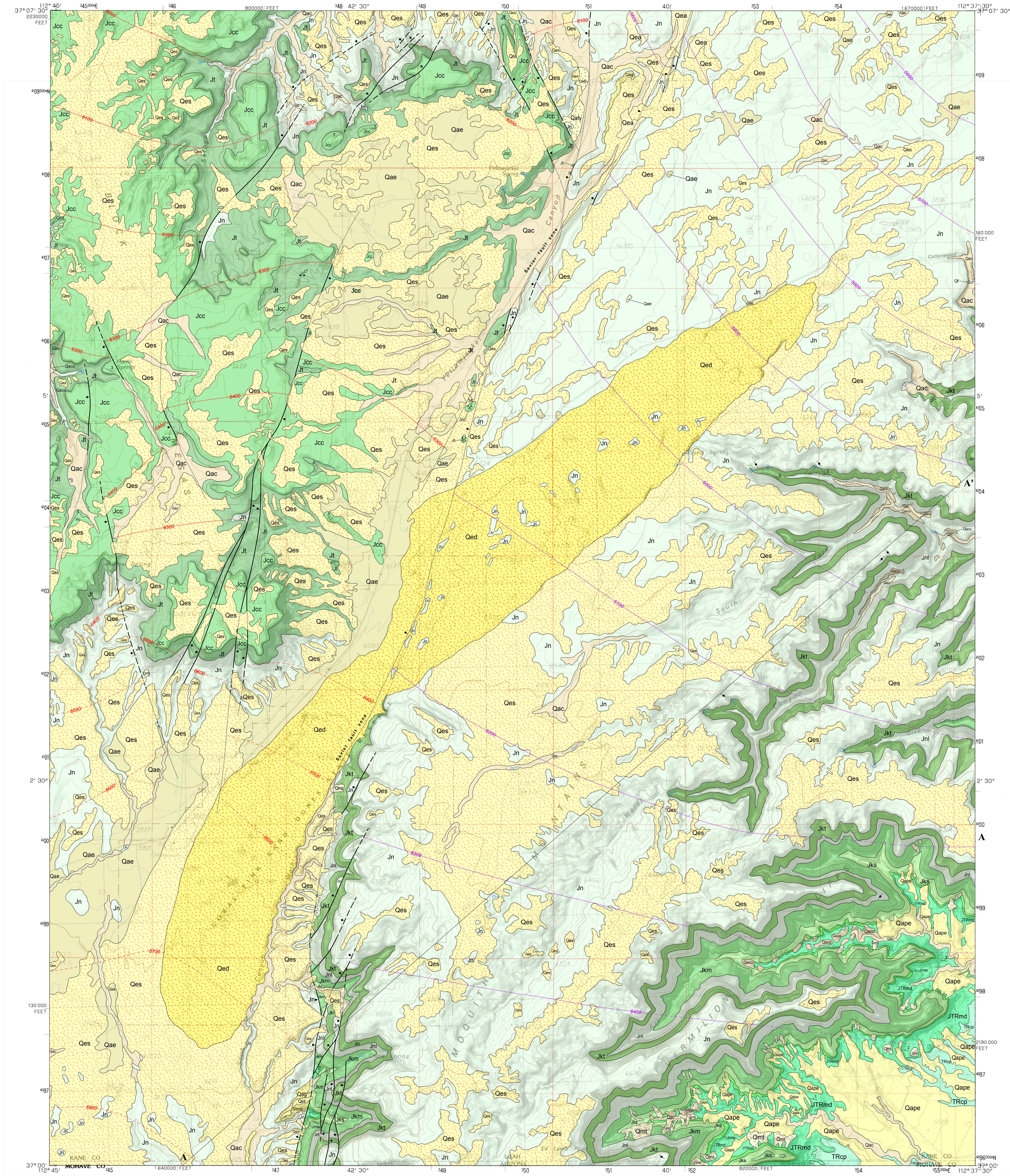

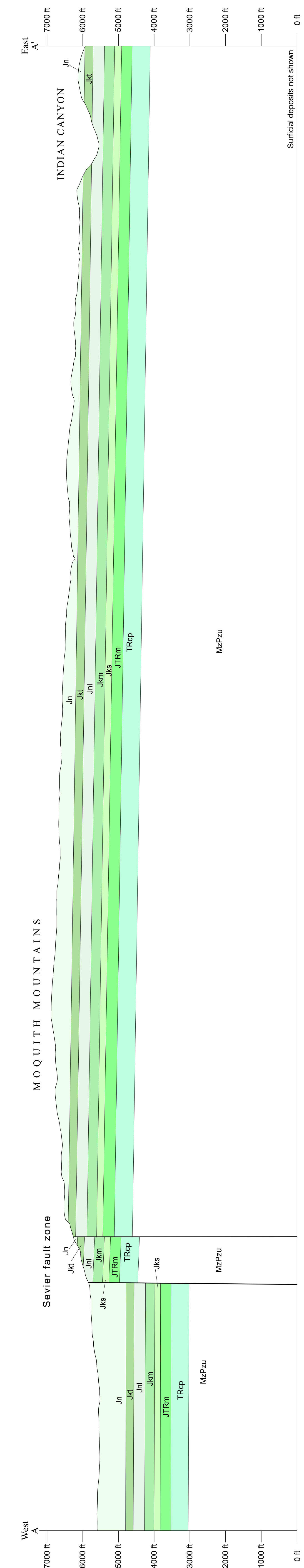

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UTAH
QUADRANGLE LOCATION

SCALE 1:24,000
1 0.5 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0.5 0 1 KILOMETER
CONTOUR INTERVAL 40 FEET

INTERIM GEOLOGIC MAP OF THE YELLOWJACKET CANYON QUADRANGLE, KANE COUNTY, UTAH, AND MOHAVE COUNTY, ARIZONA

by
Janice M. Hayden

2009

12°00'
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2009

Base from USGS Yellowjacket Canyon 7.5' Quadrangle (1985)
Projection: UTM Zone 12
Datum: NAD 1927
Spheroid: Clarke 1886

Project Manager: Robert F. Biek
GIS and Cartography: J. Buck Ehler, Lori Douglas, Basia Matyjasik

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This map was created from Geographic Information System (GIS) data.

1	2	3
4		5
6	7	8

1. The Barracks
2. Mount Carmel
3. White Tower
4. Elephant Butte
5. Kanab
6. Colorado City
7. Moccasin
8. Kaibab

ADJOINING 7.5' QUADRANGLE NAMES