Catalogue of stratigraphic names of the Black Mesa Basin and adjacent areas

Daniel S. Turner, 1958, pp. 130-135

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CATALOGUE OF STRATIGRAPHIC NAMES OF THE
BLACK MESA BASIN AND ADJACENT AREAS

DANIEL S. TURNER
Dan Turner and Associates
Geological and Engineering Consultants

This catalogue contains in alphabetical order a listing of most of the stratigraphic names used in the Black Mesa basin and adjacent areas. The list is abridged from a catalogue of 140 stratigraphic names appearing in an available report by Dan Turner and Associates. The catalogue has been compiled from the Lexicon of geologic names of the United States (Wilmarth, M. C., 1938, U.S.G.S. Bull. 896) and the published literature which postdates the Lexicon.

The form used is as follows:
1) Areal distribution as presented by the original author.
2) First reference in literature.
3) Type locality.
4) Abbreviated lithologic description and thickness in the type area.
5) General information; origin when presented by the original author; contact relationships; additional distribution; known character in the Black Mesa basin.

Oil and gas shows or production in the four-state area from comparable or correlative units is shown by (O) oil and (G) gas preceding the unit name.

Aneth shale and dolomite — U. Devonian
1) Paradox basin — subsurface only
2) Knight & Cooper, 1955, Four Cor. Gdbk., pp. 56-58
3) Shell Oil Co., Bluff Unit #1 — 32, 39N, 23E
4) Dk. dolu., interbed. w/gray, brn. & blk. sh. (170')
5) Applied in N.W. New Mexico and Four Corners area. Centered in Paradox basin.

Bolsa quartzite — M. Cambrian
1) S. E. Arizona
2) F. L. Ransome, 1904, U.S.G.S. P.P. 21, pp. 28-30
3) Bolsa Canyon, Bisbee Quad.
4) Thin-bed., x-bed. in lower w/grits (430')
5) Approx. equiv. to Tonto group in Navajo country. See also Troy quartzite.

Bright Angel shale (Tonto group) — M. Cambrian
1) N. Arizona
2) L. F. Noble, 1914, U.S.G.S. Bull. 549
3) Bright Angel Canyon
4) Soft, greenish, mic., fos. ss. & sh. w/br. x'ln. Is.
5) Applied in Central & West Navajo country. Muav Is. conf. above. Tapeats ss. conf. below.

Brushy Basin shale (member of Morrison fm.) — U. Jurassic
1) E. Utah, W. Colorado, N.W. New Mexico, N.E. Arizona
2) H. E. Gregory, U.S.G.S. P.P. 188
3) Brushy Basin, San Juan County, Utah
4) Banded gry., grn., & rd. sh. w/thin sss. & cgls. (100-300')
5) Uppermost Morrison mbr. (fluvial & lacustrine)

Burro Canyon formation — L. Cretaceous (?)
1) S.E. Utah & S.W. Colorado
2) Stokes, 1948, Guidebook to the Geology of Utah No. 3
3) Burro Canyon near Dolores River, San Miguel County, Colorado
4) Cgl., ss., Is., sh., & chert
5) Overlies Morrison fm. & underlies Dakota fm. (terrestrial)

Carmel formation — U. Jurassic
1) N.W. New Mexico, N. Arizona, E. Utah & W. Colorado
3) Mount Carmel, western Kane County, Utah.
4) Red ss. & Siltstone, rd. & grn. sh., gyp., & basal gry. Is. (local) (35 to 650')
5) Basal fm. of San Rafael group (marine & continental)

Cedar Mesa ss. member (of Cutler formation) — Permian
1) S.E. Utah — San Juan County
2) A. A. Baker & J. B. Reeside, Jr., 1929, A.A.P.G. Bull., vol. 13, no. 11, p. 1420
3) Cedar Mesa, Utah (west of Mexican Hat, San Juan County)
4) Massive wh. ss. (0-1000')
5) Underlies Organ Rack & overlies Halgaito (eolian & fluvialite)
Chinle formation — U. Triassic
1) N. Arizona, S. Utah, S.W. Colorado, N. New Mexico, S.E. Nevada
3) Chinle Valley, N.E. Arizona
4) Varietygrated sh. & aren. sh. w/thin ls. cglss. (400-1000')
5) Overlies Shinarump & underlies Wingate fm. (continental)

Chuska sandstone — Miocene (?) (Pliocene)
1) N.W. New Mexico & N.E. Arizona along State line
2) H. E. Gregory, 1916, U.S.G.S. W.S.P. 380
3) Chuska Peak, McKinley County, New Mexico
4) Wh. to gry., porous, highly x-bed. ss. (700-1000')
5) Lower Bidahochi formation

Coconino formation — U. Triassic
1) N. Arizona, S. Utah, S.E. Nevada
2) N. H. Darton, 1910, U.S.G.S. Bull. 435, pp. 21-27
3) Coconino Plateau
4) Cross-bedded wh.-gray ss. (50-610')
5) Orig. upper "Aubrey", Kaibab & Supai equiv.

Cow Springs formation — U. Jurassic
1) N. Arizona & S. Utah
3) Cow Springs Trading Post, 4 mi. E., Coconino Co., Arizona
4) Sh., Is. & qtzt. (50-300')
5) In part equiv. to Coconino ss. (eolian)

Cutler formation — Permian-Pennsylvanian
1) N.W. New Mexico & N.E. Arizona along State line
2) J. W. Harshbarger, et. al., 1957, U.S.G.S. P.P. 291
3) Lowermost U. Cretaceous formation (marin & continental)

Dakota sandstone (Weber) — Permian
1) N.W. New Mexico & S.W. Colorado, S.E. Montana
3) Dakota County, Nebraska
4) Buff, brn. & occas. red ss., gr. sh., sub-bituminous coal (100-265')
5) Overlies Shinarump & underlies Wingate fm. (continental)

De Chelly sandstone member (Cutler formation) — Permian
1) N.E. Arizona, S.E. Utah, N.E. New Mexico
3) Canyon De Chelly, Apache County, Arizona
4) Massive, x-bed., it. red, buff & brn. ss. & cgl. (0-585')
5) In part equiv. to Coconino ss. (eolian)

Dinosaurs — Jurassic-Triassic
1) S.W. Colorado
2) J. W. Harshbarger, et. al., 1957, U.S.G.S. P.P. 291
3) Dinosaur Canyon, 10 mi. E. of Cameron, Arizona
4) Lent., rd.-orange, gray, sly. ss. calc. fluviatile (202')

Dolores formation — Jurassic-Triassic
1) S.W. Colorado
2) W. Cross, 1899, U.S.G.S. Telluride Folio No. 57
3) Dolores River Valley
4) Red sss. & cglss. (800')
5) Equiv. of Kayenta, Wingate, Chine, Shinarump & Moenkopi (continental)

Elbert formation — U. Devonian
1) N.E. Arizona, S.E. Utah, N.E. New Mexico
2) J. D. Sears, 1925, U.S.G.S. Bull. 767
3) Elbert Creek, a western tributary of Animas River, Colorado
4) Sh., Is. & qtzt. (50-300')
5) Recently subdivided into Upper mbr. & McCracken ss. by Knight, 1955, Four Corners Society Gdbk. (marine)

Entrada formation (San Rafael group) — U. Jurassic
1) E. Utah, W. & Central Colorado, N. New Mexico & N.E. Arizona
2) J. Gilluly & J. B. Reeside, Jr., 1926, U.S.G.S. Press Bull. 6064, March 202'
3) Entrada Point in north part of San Rafael Swell
4) Mass. red ss. & thin-bedded red sh. & s.. (40-450')
5) Formerly called Wingate in New Mexico (eolian, some fluviatile)

Gibson member (Crevasse Canyon) — U. Cretaceous
1) N.W. New Mexico
2) J. D. Sears, 1925, U.S.G.S. Bull. 767
3) Village of Gibson, McKinley Co., New Mexico
4) Gray-wh. sss. & clay w/comm. coals (150-175')
5) Applied in De Chelly uplift. Part of Mesaverde; overlies Bartlett barren mbr.
Glen Canyon group — Triassic-Jurassic
1) S. & E. Utah, N. Arizona, S.W. Colorado & N.W. New Mexico
3) Exposures in Glen Canyon of Colorado River, Kane Co., Utah
4) Red, rd.-brn., buff, purp. & wh., sss., shs., & siltsts. (100-1000')
5) Navajo s.s., Kayenta fm., & Wingate fm. comprise group in descending order (eolian & fluviatile)

Halgaito tongue (of Cutler formation) — Permian-Pennsylvanian
1) S.E. Utah (San Juan Co.) & N.E. Arizona
3) Halgaito Spring, S.W. of Mexican Hat, Utah
4) Red s.s. & sdy. sh. (0-430')
5) Underlies Cedar Mesa s.s. & overlies Rico fm. (fluviatile)

Hartmann limestone — M. Cambrian
1) Central N. Utah
2) J. Gilluly, 1932, U.S.G.S. P.P. 173
3) Hartmann Gulch, N. of Ophir, Utah
4) Gray mot. Is. w/sh. ptgs. oolitic (650')
5) Oqurrh Mountains region. Conf. under Bowman Is. grad. to underlying Ophir

Hermit shale (Aubrey group) — Permian
1) N. Arizona, S. Utah, S.E. Nevada
2) L. F. Noble, 1922, U.S.G.S. P.P. 131B

Hermosa formation — Pennsylvanian
1) S.W. Colorado, S.E. Utah, N.E. Arizona, N.W. New Mexico
2) W. Cross & A.C. Spencer, 1899, U.S.G.S. La Plata Folio, no. 60, p. 8
3) Hermosa Creek, Colorado
4) Carbonate sequence w/inbd. shs. & ss. (800-2000')
5) Recently subdivided into Hermosa, Paradox & Pinkerton Trail fms. by Wengler & Strickland, 1954, A.A.P.G. vol. 38 (marine)

Holbrook member (Menokopı) — L. Triassic
1) E. Arizona
2) D. Hager, 1922, Min. & Oil. Bull. vol. 8, #1, 2, 3
3) Cliffs between Winslow & Holbrook
4) Thin x-bed. sss., mudst. pellets, cly. red
5) Applied in Central Navajo country. Unconf. under Shinarump

Hoskinnini tongue (of Cutler formation) — Permian
1) S.E. Utah (San Juan Co.) & N.E. Arizona
2) A. A. Baker & J. B. Reeside, Jr., 1929, A.A.P.G. Bull. vol. 13, no. 11, pp. 1422-1446
3) Hoskinnini Mesa, between Lees Ferry & Kayenta, Arizona
4) Red s.s. & sdy. shs.
5) Upper member of Cutler (fluviatile)

Junction Creek sandstone — U. Jurassic
1) S.W. Colorado, vicinity of La Plata Mtns.
3) Junction Creek, S.E. flank of La Plata Mtns., Colorado
4) X-bed., clean, mass., wh. ss. (0-500')
5) Equiv. (?) of Bluff s.s. (eolian)

Kaibab limestone (Aubrey group) — Permian
1) N. Arizona, S. Utah, S.E. Nevada
2) N. N. Darton, 1910, U.S.G.S. Bull. 435
3) Kaibab Gulch, 8 mi. S.W. Paria, Utah
4) Dense, chty. Is., gray (820')
5) Under Moenkopi fm., over Hermit sh.

Kayenta formation (of Glen Canyon group) — L. Jurassic
1) S.E. & S. Utah, N.E. Arizona, S.W. Colorado
3) One mi. N. of Kayenta, Arizona
4) Red, gry., & lavender ss. w/subordinate shs. (15-320')
5) Middle fm. of Glen Canyon group (fulvial)

Leadville limestone — Mississippian
1) Colorado, N.W. New Mexico, N.E. Arizona, S.E. Utah
2) G. H. Eldridge, 1894. U.S.G.S. Anthracite-Crested Butte Folio no. 9
3) Leadville mining district
4) Mass. Is. & dolomites w/inbd. shs. & chert
5) Unconformably overlies Devonian Ouray fm. & overlies Penn. Molas fm. (marine)

Lukachukai member (Wingate) — U. Triassic
1) N.W. New Mexico, N.E. Arizona
2) J. W. Harshbarger, et. al., 1957, U.S.G.S. P. P. 291
3) Escarpment northeast of Lukachukai, Ariz., Apache County
4) Ss., x-bed. eolian, rd.-br., f.g. (300')
5) Upper member, intertongues with Rock Point member, Wingate sandstone

Madison limestone — L. Mississippian
1) Montana, Wyoming, Idaho, Utah (Arizona(?))
2) A. C. Peale, 1893, U.S.G.S. Bull. 110
3) Madison Range, Threeforks Quad. Mont.
4) Mass. jasp. Is.; blue-gray & part laminate (1250')
5) Underlain by Quadrant in type area

Mancos shale — U. Cretaceous
1) W. Colorado, N.W. New Mexico, E. Utah, S. & Central Wyoming
2) W. Cross, 1899, U.S.G.S. Telluride folio no. 57
3) Mancos valley near town of Mancos, S.W. Colorado
5) Overlies Dakota & underlies Mesaverde (marine)

Martin limestone — U. Devonian
1) S.E. & Central Arizona
2) F. L. Ransome, 1904, U.S.G.S. P. P. 21
3) Mt. Martin, Escabrosa Range, Arizona
4) Dk. gray, hd. compact, lt. to pink Is. (340')
5) Applied in Central Arizona. Approx. equiv. to Temple Butte Is., in Navajo country and Elbert and Ouray in N.W. New Mexico
McCracken sandstone member (Elbert formation) —
U. Devonian
1) Paradox Basin - subsurface only
2) Knight & Cooper, 1955, Four Corners Gdbk., pp. 56-58
3) McCracken Mesa, Shell Oil, Bluff Unit ±1, cores
4) Ss., green to gray, subangular, f.-v.f.g., glauc., ptly. dolo. (112')

Mesaverde group (also formation) — U. Cretaceous
1) W. Colorado, N.W. New Mexico, N.E. Arizona, E. Utah, Central & N. Wyoming
3) Mesaverde, Montezuma County, Colorado
4) Ss., sh., & coal (500-800')
5) Composed of Cliff House, Menefee & Point Lookout fms., Yale Point ss., Toreva fm. by Repenning & Page, 1956 (marine & near marine)

Moenave formation — U. Triassic
1) Arizona, Black Mesa basin
2) Harshbarger et al., 1957, U.S.G.S. P. F. 291
3) Moenave, 6 mi. W. of Tuba City, Arizona
4) Ss. & silty ss., two mbrs.
5) Mbrs. Springdale ss., Dinosaur Canyon. Overlain by Kayenta fm. Overlies Lukachukai mbr. of Wingate

Moenkopi formation — L. Triassic
1) Arizona, S. Utah, S.E. Nevada, S.W. Colorado, N.W. New Mexico
3) Moenkopi Wash, Grand Canyon, Arizona
4) Dark red-brn. sh. & shy. ss. (0-940')
5) Basal Triassic unit (fluvialite & Marine)

Molas formation — Pennsylvanian
1) Four Corners area
3) Molas Lake, N. of Durango, Colorado
4) Red calc. shs. & sss. & lenticular Iss. (0-200')
5) Disconformably overlies Mississippian strata (marine and continental)

Monitor Butte member — Chinle
1) N. Central Arizona & S. Utah
3) Monitor Butte, Utah; T. 41 S., R. 12 E.
4) Mdsl., slst., & ss., indurated, bentonites at base. (0-500')
5) Applied in Central & W. Navajo country

Moqui member (Moenkopi) — L. Triassic
1) S. Black Mesa basin
2) McKee, 1954, Geol. Soc. Amer., Mem. 61
3) Moqui Wash
4) Slst., clayst., lt. olive-gray, pale br. w/gypsum
5) Applied in Central Navajo country, Mid. mbr. of Moenkopi. Unfoss.

Morgan formation (Hermosa) — Pennsylvanian
1) N.E. Utah
2) E. Blackwelder, 1910, G.S.A. Bull., vol. 21, p. 519
3) Weber River Canyon, Utah. Town of Morgan
4) Soft earthy ss., pink, weathers red w/ls. (500-2000')
5) Local distribution (terrestrial)

Morrison formation — U. Jurassic
2) G. H. Eldridge, 1896, U.S.G.S. Mon. 27
3) Morrison, Colorado, near Denver
4) Varicolored shs. & sss. (600-1000')
5) Divided into four members in descending order: Brushy Basin sh., Westwater ss., Recapture sh. & Salt Wash

Muav limestone (Tonto group) — M. Cambrian
1) N. Arizona, Grand Canyon
2) L. F. Noble, 1914, U.S.G.S. Bull. 549
3) Muav Canyon, Grand Canyon
4) Bl-gray, thin-bedded, mottled, buff sh. & ls. (450-475')
5) Applied in Central & W. Navajo Country

Naco formation—Pennsylvanian (limestone)
1) S.E. Arizona
2) F. L. Ransome, 1904, U.S.G.S. P. P. P. 21
3) Naco Hills, Bisbee Quad.
4) Lt., stratified, foss., crinoidal, cherty (2000')
5) Rest conf. on Escabrosa ls. Before erosion possibly 3000' thick overlain by Glance cgl. (cret.)

Navajo sandstone (Glen Canyon group) — Jurassic
1) N. Arizona, S. Utah, W. Colorado
3) Navajo Canyon, Arizona
4) Mass., highly x-bed. red & buff ss. (0-600')
5) Disconformably underlies San Rafael group (eolian)

Organ Rock tongue of Cutler formation) — Permian
1) S.E. Utah & N.E. Arizona
2) A. A. Baker & J. B. Reeside, Jr., 1929, A.A.P.G. Bull., vol. 13, no. 11, 1420-1446
3) Organ Rock, San Juan Co., Utah, a natural rock monument
4) Red sdy. sh. & sss. (0-550')
5) Underlies DeChelly & overlies Cedar Mesa (continental)

Ouray limestone — U. Devonian
1) Four Corners area
2) W. Cross & A. C. Spencer, 1899, U.S.G.S. La Plata Folio no. 60, p. 8
3) Ouray, Colorado, at junction of Canon Creek & Uncompahgre River
4) Mass. sh. to gry, ls. w/inbd. marls (0-300')
5) Overlies Elbert fm. (Dev.) & underlies Leadville (Miss.) (marine)

Owl Rock member (Chinle) — U. Triassic
1) N. Black Mesa Basin
3) Owl Rock, N. of Kayenta, Arizona
4) Hd. sil. ls., w/red calc. sh.
5) Division B of Gregory, 1917
Paradox member (or formation) — M. Pennsylvanian
1) N.W. New Mexico, W. Colorado, & S.E. Utah
2) A. A. Baker, 1933, U.S.G.S. Bull. 841
3) Paradox Valley, Montrose County, Colorado
4) Salt, anhydrite, inbd. blk. & brn. sh. & ls. (0-3,000')
5) Almost wholly encompassed by Hermosa fm. of which it is considered a facies by many geologists (marine evaporites)

Pinkerton Trail limestone (Hermosa) — Pennsylvanian

Pinkerton Trail limestone (Hermosa) — Pennsylvanian

Pony Express limestone — U. Jurassic
1) Four Corners area
2) H. E. Gregory, 1950, U.S.G.S. P.P. 220
3) Petrifed Forest N. Mon., Paint Pots
4) Lent. sh., marls; talc. ss.; Is. cgls.
5) Applied in Defiance uplift & N.W. New Mexico (marine)

Recapture shale member (of Morrison formation) — U. Jurassic
1) Four Corners area
2) H. E. Gregory, U.S.G.S. P.P.
3) Recapture Creek, San Juan County, Utah
4) Variegated shs. & thin sss. (100-400')
5) Important ore-bearing horizon (fluvial)

Redwall limestone — M. Mississippian
1) N. Arizona
3) Grand Canyon walls
4) Ls., purp.-gray, cherty (5-700')
5) Unconf. underlies Supai, orig. a part of same

Rico formation — Pennsylvanian & Permian
1) Four Corners area
2) G. K. Gilbert, 1875, U.S.G.S. Telluride folio, no. 57
3) Wash, 1899, U.S.G.S. Telluride folio, no. 57
4) Rich Mountain
5) Transition between marine Hermosa & overlying continental Cutler fm.

Rock Point member (Wingate) — U. Triassic
1) Navajo Country, Black Mesa basin
3) Raw data
4) Pale red-br., x-bed. in part, round qtz. (344')
5) Applied in Four Corners & Navajo country. Also known as "board bedded Wingate"

Salinaral shale member (of Moenkopi) — Triassic
1) N.W. New Mexico
2) G. N. Wood & S. A. Northrop, 1946, U.S.G.S. P. M. 57
3) Salitrail Creek, T. 22 N., R. 213 W., Rio Arriba Co., New Mexico
4) Var. sh., w./ls. conc. (30-100')
5) Momper & Horacek, 1957, consider part of Moenkopi

Salt Wash sandstone member (of Morrison formation) — U. Jurassic
1) Four Corners area
2) C. T. Lupton, 1941, U.S.G.S. Bull. 541
3) Salt Wash, Grand County, Utah
4) Lt. gry. ss. & inbd. thin shs. (100-350')
5) Basal mbr. of Morrison. Important uranium-bearing horizon (fluvial)

San Andres formation — Permian (Leonard)
1) New Mexico
2) W. T. Lee, 1909, U.S.G.S. Bull. 389
3) N. end San Andres Mtns.
4) Ls., dol., ss. & evap. (0-150')
5) Equiv. to Kaibab of Arizona (marginal marine & marine)

San Rafael group — U. Jurassic
1) S. & E. Utah, W. Colorado, N.E. Arizona, N. New Mexico
2) Reeside et al., 1927, A.A.P.G. Bull., vol. 11, p. 787
3) San Rafael Swell, Utah
4) Variegated shs., sss., sltsts. & some Is. (100-1000')
5) Includes (descending) Summerville, Curtis-Toddillo, Entrada, and Carmel fms. (continental & marine)

Shinarump conglomerate — U. Triassic (Shinarump member, Chinle formation)
3) Shinarump Cliffs, Kane County, Utah
4) Cgl. ss. & sh. (0-125')
5) Important uranium producer (continental)

Sinbad limestone (Moenkopi) — L. Triassic
1) Central E. Utah, San Rafael Swell
2) Reeside & Gilluly, 1927, A.A.P.G. Bull., vol. 11, no. 5, p. 797
3) San Rafael Swell, Sinbad Plateau
4) Thk. bedded, It. gray, sdy, Is. (40-150')
5) About 320' above base Moenkopi in type area. Varies 40-150' thick in Sinbad Plateau

Snyder Hill formation — Permian
1) S.E. Arizona
2) A. A. Stoyanow, 1936, G.S.A. Bull., vol. 47, no. 4
3) Snyder Hill, 10 mil. S.W. Tucson, Arizona
4) Bk. fss. Is., thin-bedded, bryozoans (2-500')
5) Applied in E. Central Arizona. Approx. equiv. of Toroweap fm. and De Chelly ss.

Sonsela sandstone bed, Petrifed Forest mbr. (Chinle) — U. Triassic
1) E. Black Mesa basin
3) Sonsela Buttes, Arizona
4) Firm cem., lt. gray ss. (131')
5) Applied in Defiance uplift area. Absent W. of Chinle Valley. Intra-mbr. of Petrifed Forest mbr. - Chinle
Springdale sandstone (Moenave) — U. Triassic
1) S. Central Utah into Navajo country
2) H. E. Gregory, 1950, U.S.G.S. P. P. 220
3) Springdale, Washington Co., Utah
4) Laminate, pale red x-bed., w/sh. lenses & mud pockets (100-150')

Summerville formation — U. Jurassic
1) Four Corners area
2) J. Gilluly & J. B. Reeside, Jr., 1926, U.S.G.S. Press, Bull. 6064
3) Summerville Point in N. end of San Rafael Swell, Utah
4) Red, red-brn., & gr. sltsts., sh. & ss., some gyp-beds (15-200')
5) Uppermost fm. in San Rafael group (continental)

Supai formation — Permian & Pennsylvanian
1) N. Arizona, S. Utah & S.E. Nevada
3) Supai village, on Catheract Creek, N. Arizona
4) Red beds (2) sep. by mass. Is.
5) Unconf. on Kaibab. Erratic thickness by basal unconf.

Tapeats sandstone (Tonto group) — M. Cambrian
1) N. Arizona, Grand Canyon
2) L. F. Noble, 1914, U.S.G.S. Bull. 549
3) Tapeats Creek, Grand Canyon
4) Br. slabby, x-bed. ss., w/cgl. lenses (0-285')
5) Applied in Central & W. Navajo country. Rests unconf. on Dox ss. of Unkar group.

Temple Butte limestone — U. Devonian
1) N. Arizona
2) C. D. Walcott, 1889, G.S.A. Bull., vol. 1, p. 50
3) Temple Butte, 3 mi./ Jet. Little Colorado River-
4) Purp. & cream Is. & ss. (0-100')
5) Applied in Central Navajo country. Approx. equivel. of Elbert, Aneth & Martin fms. of Four Corners

Timpoonek member (Moenkopi) — L. Triassic
1) S. & S.W. Utah
2) H. E. Gregory, 1948, G.S.A. vol. 59, pp. 211-248
3) Virgin River Valley, S.W. Utah
4) Cgl., Is. & var. sh. (13-452')
5) Unconf. on Kaibab. Erratic thickness by basal unconf. & eros. upper contact

Tonto group — M. Cambrian
1) Grand Canyon & N. Arizona
3) Tonto Creek trib. of Salt River, Arizona
4) Is., mot., aren. sh., vitreous ss. (800' + or -)
5) Applied in Central Navajo country. Members: Muov Is., Bright Angel sh. & Tapeats sandstone

Toreva formation (Mesaverde) — U. Cretaceous
1) Rim Rock (basal mbr.) of Black Mesas
3) Toreva
4) Fine to med. grained ss. (128'), black sh. (106'), fine grained ss. (79')
5) Basal unit of Mesaverde group on rim of Black Mesa

(0) Toroweap formation (Aubrey group) — Permian
1) Nevada, S.W. Utah, N.W. Arizona
3) East wall Toroweap Valley, Arizona
4) Red beds (2) sep. by mass. Is.
5) Underlies Kaibab in W. Arizona, etc.

Wanakah formation — U. Jurassic
1) S.W. Colorado (San Juan Mtns.)
2) W. S. Burbank, 1930, Colo. Sci. Soc. Proc., vol. 12, no. 6, p. 172
3) Wanakah mine, Ouray district
4) Sh. & ss. (65')
5) Equiv. to Summerville fm. to S. & W. (continental)

Wepo formation (Mesaverde) — U. Cretaceous
1) Limited to Black Mesa
3) Pinyon, Arizona
4) Interbed. arkose ss., shs. & coal (165')
5) Thins northward on Black Mesa, intertongues with Toreva, correlative with Navajo.

White Rim sandstone member (Cutler formation) — Permian
1) S.E. Utah
2) A. A. Baker & J. B. Reeside, 1929, A.A.P.G. Bull., vol. 13, no. 11, p. 1444
3) White Rim betw. Green & Colorado Rivers, Utah
4) White ss. (0-100') + or -
5) Equiv. to Cedar Mesa. Top of Cutler formation

Whitetail conglomerate (Miocene (?))
1) Central Arizona
2) F. L. Ransome, 1903, U.S.G.S. P. P. 12
3) White Tail Gulch, Globe Quadr.
4) Fluvialite, ang. frag. diabase & Is.

Wingate sandstone — U. Triassic
1) N.W. New Mexico, N.E. Arizona, S.E. Utah
3) Fort Wingate, McKinley Co., New Mexico
4) Mass. red & red-brn. sss., sltsts. & shs. (100-600')
5) Basal fm. of Glen Canyon group. Recently subdivided into Lukachukai (upper) and Rock Point (lower) members by U.S.G.S. P. P. 291 (fluvial & eolian)

Wupakoki member (Moenkopi) — L. Triassic
1) Southern & Western Black Mesa basin
2) E. D. McKeel, 1954, Geol. Soc. Amer. Mem. 61
3) Wupakoki Nat. Mon., Arizona
4) Interbed., mass. ss., thin-bed. sst & crumbly mdst.

Yale Point sandstone (Mesaverde) — U. Cretaceous
1) Yale Point to South Rim - Black Mesa
3) Yale Point on Black Mesa
4) Cse. to med. ss., x-bed., lenticular (300')
5) Thins southward, intertongues with Wepo fm.