New Mexico Geological Society

Downloaded from: https://nmgs.nmt.edu/publications/guidebooks/9



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

Daniel S. Turner
1958, pp. 130-135. https://doi.org/10.56577/FFC-9.130

in:

Black Mesa Basin (Northeastern Arizona), Anderson, R. Y.; Harshbarger, J. W.; [eds.], New Mexico Geological Society 9th Annual Fall Field Conference Guidebook, 205 p. https://doi.org/10.56577/FFC-9

This is one of many related papers that were included in the 1958 NMGS Fall Field Conference Guidebook.

Annual NMGS Fall Field Conference Guidebooks

Every fall since 1950, the New Mexico Geological Society (NMGS) has held an annual Fall Field Conference that explores some region of New Mexico (or surrounding states). Always well attended, these conferences provide a guidebook to participants. Besides detailed road logs, the guidebooks contain many well written, edited, and peer-reviewed geoscience papers. These books have set the national standard for geologic guidebooks and are an essential geologic reference for anyone working in or around New Mexico.

Free Downloads

NMGS has decided to make peer-reviewed papers from our Fall Field Conference guidebooks available for free download. This is in keeping with our mission of promoting interest, research, and cooperation regarding geology in New Mexico. However, guidebook sales represent a significant proportion of our operating budget. Therefore, only *research papers* are available for download. *Road logs*, *mini-papers*, and other selected content are available only in print for recent guidebooks.

Copyright Information

Publications of the New Mexico Geological Society, printed and electronic, are protected by the copyright laws of the United States. No material from the NMGS website, or printed and electronic publications, may be reprinted or redistributed without NMGS permission. Contact us for permission to reprint portions of any of our publications.

One printed copy of any materials from the NMGS website or our print and electronic publications may be made for individual use without our permission. Teachers and students may make unlimited copies for educational use. Any other use of these materials requires explicit permission.

This page is intentionally left blank to maintain order of facing pages.

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:

Unit name, group name, and age.

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. dolo., interbed. w/gray, brn. & blk. sh. (170')
5) Applied in N.W. New Mexico and Four Corners area. Centered in Paradox basin.

Aubrey group — Permian and Pensylvanian
1) N. Arizona, S. Utah, S.E. Nevada
2) G. K. Gilbert, 1875, 100th Mer. Survey, vol. 3
3) Aubrey Cliffs near Camp Apache, Arizona
4) Cherty lss., yell. ss., red & wh. sh. (2620' max.)
5) Approx. correlation with De Chelly ss. & Kaibab ls., Coconino, Hermit sh. & Supai fm.

Bartlett member (Crevasse Canyon) — U. Cretaceous
1) N.W. New Mexico
2) J. D. Sears, 1925
3) Bartlett shaft mine
4) Lt. gray-wh. ss., gray shs. & coals (330-400')
5) Applied in Defiance uplift, underlies Gibson & overlies Dilco member.

Bidahochi formation — Pliocene
1) N.E. Arizona
2) A. B. Reagan, 1924, Pan Am. Geol., vol. 41, p. 366
3) 15-20 mi. N.E. of Bidahochi
4) Lava & clastic igneous w/sh. & ss.
5) Ident. w/cornfields — Sunrise Springs, Ganado series & White Cone series. In Hopi volcanics.

Bluff sandstone — U. Jurassic
1) Four Corners area
2) A. A. Barker, C. H. Dane, & J. B. Reeside, Jr., 1936, U.S.G.S., P.P. 183, p. 21
3) Bluff, Utah
4) Wh., gray, buff, & brn. mass. to thin-bed., x-bed. ss. (15-250')
5) Considered in part equiv. to Summerville (eolian & fluvial).

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. ls.
5) Applied in Central & West Navajo country. Muav ls. conf. above. Tapeats ss. conf. below.

Brushy Basin shale (member of Morrison fm.) — U. Juarassic
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., ls., 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
2) J. Gilluly & J. B. Reeside, Jr., 1926, U.S.G.S. Press Bull. 6064.
3) Mount Carmel, western Kane County, Utah.
4) Red ss. & Siltstone, rd. & grn. sh., gyp., & basal gry. ls. (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 Rock & overlies Halgaito (eolian & fluviatile)

Chinle formation — U. Triassic
1) N. Arizona, S. Utah, S.W. Colorado, N. New Mexico, S.E. Nevada
2) H. E. Gregory, 1915, Am. Jour. Sci. 4th., vol. 40, p. 102
3) Chinle Valley, N.E. Arizona
4) Variegrated sh. & aren. sh. w/thin ls. cgls. (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 sandstone (Weber) — Permian
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 sandstone — U. Jurassic
1) N. Arizona & S. Utah
2) J. W. Harshbarger, et. al., 1951, N. M. Geol. Soc. Gdbk.
3) Cow Springs Trading Post, 4 mi. E., Coconino Co., Arizona
4) Ss., gr.-gray-yell., figr., x-bed., smooth slopes (342')
5) Similar appearance to Navajo. Intertongues w/ Morrison fm.

Crevasse Canyon formation — U. Cretaceous
1) N.W. New Mexico
2) J. E. Allen & R. Balk, 1958, N.M.B.M. Bull. 36, p. 91
3) Catron Creek 3 mi. S.W. of mouth of Crevasse Canyon, Tohatchi Quad., New Mexico
4) Ss., slst., sh., coal (400-800')
5) Partly equiv. to Mesaverde group. Applied in Defiance uplift. Correlative with Wepo fm. on Black Mesa.

Curtis formation (of San Rafael group) — U. Jurassic
1) S.E. & Central Utah & S.W. & N.W. Colarado
2) J. Gilluly & J. B. Reeside, Jr., 1926, U.S.G.S. Press Bull. 6064, March 30.
3) Curtis Point on N.E. side of San Rafael Swell, S.E. Utah
4) Gray ss. & grn.-gry. sh. & cgl. (76-253')
5) Equiv. (?) of Todilto ls. fm. of N.M. (marine)

Cutler formation — Permian-Pennsylvanian
1) Four Corners area
2) W. Cross & E. Howe, 1905, U.S.G.S. Silverton, Folio no. 120
3) Cutler Creek 4 mi. N. of Ouray, Colorado
4) Red sss., sdy. shs. & lss., & cgls. (1000-1700')
5) Includes Hoskinnini, De Chelly, Organ Rock, Cedar Mesa & Halgaito mbrs. (continental, some marine)

(O.G.) Dakota formation — U. Cretaceous
1) N.E. Arizona, N. New Mexico, E. & S.W. Colorado, S.E. Utah, Nebraska, Kansas, N. Dekota, S. Dakota, N.W. Aklahoma, S.E. Montana (?) & E. Wyoming (?)
2) F. B. Meek & F. V. Hayden, 1862, Phila. Acad. Nat. Sci. Proc., vol. 13, pp. 419-420
3) Dakota County, Nebraska
4) Buff, brn. & occas. red ss., gr. sh., sub-bituminous coal (100-265')
5) Lowermost U. Cretaceous formation (marine & continental)

(O) De Chelly sandstone member (Cutler formation) — Permian
1) N.E. Arizona, S.E. Utah, N.E. New Mexico
2) H. E. Gregory, 1915, Am. Jour. Sci., 4th., vol. 40, p. 102
3) Canyon De Chelly, Apache County, Arizona
4) Massive, x-bed., lt. red, buff & brn. ss. & cgl. (0-585')
5) In part equiv. to Coconino ss. (eolian)

Dilco member (Crevasse Canyon) — U. Cretaceous
1) N.W. New Mexico
2) J. D. Sears, 1925, U.S.G.S. Bull. 767
3) Dilco Village (Dilco mine)
4) Gray-wh.-lent. sss. w/comm. coal (240-3000')
5) Applied in Defiance uplift. Under Bartlett/barren mbr. Overlies Gallup ss., all Mesaverde.

Dinosaur Canyon member (Moenave) — U. Triassic
1) Navajo country, Arizona and S. Utah
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, slty. ss. calc. fluviatile (202')
5) Org. part of Painted Desert beds. (L. F. Ward, 1901) Wingate & Chinle fms. Colbert & Mook, 1951 ident. as orange red ss.

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. & cgls. (800')
5) Equiv. of Kayenta, Wingate, Chinle, Shinarump & Moenkopi (continental)

Elbert formation — U. Devonian
1) Four Corners area
2) W. Cross, 1904, Am. Jour. Sci., 4th., vol. 18, pp. 245-252
3) Elbert Creek, a western tributary of Animas River, Colorado
4) Sh., ls. & 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, 1926
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 Defiance 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
2) Reeside, Dobbin, Baker & McKnight, 1927, A.A.-P.G. Bull., vol. 11, p. 787
3) Exposures in Glen Canyon of Colorado River, Kane Co., Utah
4) Red, rd.-brn., buff, purp. & wh., sss., shs., & sltsts. (100-1000')
5) Navajo ss., 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
2) Baker & Reeside, 1929, A.A.P.G. Bull., vol. 13, no. 11, pp. 1420-1446
3) Halgaito Spring, S.W. of Mexican Hat, Utah
4) Red sss. & sdy. sh. (0-430')
5) Underlies Cedar Mesa ss. & 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. ls. w/sh. ptgs. oolitic (650')
5) Oqurrh Mountains region. Conf. under Bowman ls. 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
3) Hermit Basin
4) Brick red, sdy. sh. & figr. sss. (267-317')
5) Applied in western Navajo country. Thin platy lamination. Unconf. over Supai fm.

(O.G.) 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 Wengerd & Strickland, 1954, A.A.P.G. vol. 38 (marine)

Holbrook member (Moenkopi) — 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 sss. & sdy. shs.
5) Upper member of Cutler (fluviatile)

Junction Creek sandstone — U. Jurassic
1) S.W. Colorado, vicinity of La Plata Mtns.
2) Soklman & Spencer, 1941, A.A.P.G. Bull., vol. 25, pp. 1745-1767
3) Junction Creek, S.E. flank of La Plata Mtns., Colorado
4) X-bed., clean, mass., wh. ss. (0-500')
5) Equiv. (?) of Bluff ss. (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. ls., 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
2) A. A. Baker, C. H. Dane & E. T. McKnight, 1931, U.S.G.S. Prel. Map
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. lss. & dolomites w/inbd. shs. & chert
5) Unconformably overlies Devonian Ouray fm. & underlies 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. ls.; 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
4) Soft lt. gray to v. dk. gry. sh., v. sdy. in part. Thin shy. lss. & calc. sss., highly foss. in part. (1200-3000')
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 ls. (340')
5) Applied in E. Central Arizona. Approx. equiv. to Temple Butte ls. 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')
5) Applied in N.W. New Mexico, S.E. Utah, N.E. Arizona. Above Aneth formation.

(G) Mesaverde group (also formation) — U. Cretaceous
1) W. Colorado, N.W. New Mexico, N.E. Arizona, E. Utah, Central & N. Wyoming
2) W. H. Holmes, 1877, U.S. Geol. & Geog. Surv. Terr. 9th Ann. Rept. for 1875, pp. 245, 248, pl. 35
3) Mesaverde, Montezuma County, Colorado
4) Ss., sh., & coal (500-800')
5) Composed of Cliff House, Menefee & Point Lookout fms., Yale Point ss., Wepo fm., Toreva fm. by Repenning & Page, 1956 (marine & near marine)

Moenave formation — U. Triassic
1) Navajo country, Black Mesa basin
2) Harshbarger et al., 1957, U.S.G.S. P. P. 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
2) L. F. Ward, 1901, Am. Jour. Sci., 4th vol. 12, pp. 401-413
3) Moenkopi Wash, Grand Canyon, Arizona
4) Dark red-brn. sh. & shy. ss. (0-940')
5) Basal Triassic unit (fluviatile & Marine)

Molas formation — Pennsylvanian
1) Four Corners area
2) W. Cross & E. Howe, 1905, U.S.G.S. Silverton folio, no. 120, & Geol. Soc. Am. Bull., vol. 16, pp. 470-496
3) Molas Lake, N. of Durango, Colorado
4) Red calc. shs. & sss. & lenticular lss. (0-200')
5) Disconformably overlies Mississippian strata (marine and continental)

Monitor Butte member — Chinle
1) N. Central Arizona & S. Utah
2) J. H. Stewart, 1957, A.A.P.G. Bull., vol. 41, no. 3, p. 452-453
3) Monitor Butte, Utah; T. 41 S., R. 12 E.
4) Mdst., 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, weahters red w/ls. (500-2000')
5) Local distribution (terrestrial)

(G) Morrison formation — U. Jurassic
1) Colorado, N. New Mexico & N.E. Arizona, E. Utah, Wyoming, W. S. Dakota, Central S. Montana, W. Oklahoma & W. Kansas
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. 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
2) H. E. Gregory, 1915, Am. Jour. Sci., 4th., vol. 40, pp. 102-112
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
2) J. H. Stewart, 1957, A.A.P.G. Bull. vol. 41, no. 3, pp. 548
3) Owl Rock, N. of Kayenta, Arizona
4) Hd. sil. ls., w/red calc. sh.
5) Division B of Gregory, 1917

(O.G.) Paradox member (or formation) — M. Pennsylvanian
1) N.W. New Mexico, W. Colorado, & S.E. Utah (Paradox Basin)
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. (0-3000'+)
5) Almost wholly encompassed by Hermosa fm. of which it is considered a facies by many geologists (marine evaporites)

Petrified Forest member (Chinle) — U. Triassic
1) Navajo Reservation & E. Black Mesa basin
2) H. E. Gregory, 1950, U.S.G.S. P.P. 220
3) Petrified Forest N. Mon., Paint Pots
4) Lent. sh., marls; calc. ss.; ls. cgls.

Pinkerton Trail limestone (Hermosa) — Pennsylvanian
1) Four Corners region
2) Wengerd & Strickland, 1954, A.A.P.G. Bull., vol. 38, p. 2157
3) Pinkerton Trail, La Plata Co., Colorado
4) Gray ls., sh., sltst., ss., reefs
5) Applied in Defiance uplift & N.W. New Mexico (marine)

Pony Express limestone — U. Jurassic
1) S.W. Colorado (San Juan Mountains)
2) J. D. Irving, 1905, U.S.G.S. Bull. 260, p. 56
3) Pony Express mine in Ouray District
4) Limestone, sh., & breccia (0-70')
5) Important ore-bearing horizon. Equiv. Todilto ls. in San Juan Basin (lacustrine(?))

Recapture shale member (of Morrison formation) — U. Jurassic
1) Four Corners area
2) H. E. Gregory, U.S.G.S. P.P. 188
3) Recapture Creek, San Juan County, Utah
4) Variegated shs. & thin sss. (0-300')
5) Overlain by Westwater ss. & underlain by Salt Wash ss. (fluvial)

Redwall limestone — M. Mississippian
1) N. Arizona
2) G. K. Gilbert, 1875, 100th Mer. Sur., U.S.G., vol. 3, p. 162
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) W. Cross, 1899, U.S.G.S. Telluride folio, no. 57
3) Rico Mountains, Colorado
4) Red shs., sss. & cgls. w/intercalated lss., partially foss. (100-250')
5) Transition between marine Hermosa & overlying continental Cutler fm.

Rock Point member (Wingate) — U. Triassic
1) Navajo Country, Black Mesa basin
2) J. W. Harshbarger, et al., 1957, U.S.G.S. P. P. 291
3) Rock Point School, Apache Co., Arizona
4) Pale red-br., x-bed. in part, round qtz. (344')
5) Applied in Four Corners & Navajo country. Also known as "board bedded Wingate"

Salitral 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) Salitral 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 ls. (100-1000')
5) Includes (descending) Summerville, Curtis-Todilto, Entrada, and Carmel fms. (continental & marine)

Shinarump conglomerate — U. Triassic (Shinarump member, Chinle formation)
1) S. Utah, N. Arizona, N.W. New Mexico, S.W. Colorado & S.E. Nevada. Reassigned to Chinle by Stewart, 1957, A.A.P.G.
2) G. K. Gilbert, 1875, U.S. Geol. & Geog. Surv. W. 100th Mer., vol. 3, pp. 1-187
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, lt. gray, sdy, ls. (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) Blk. foss. ls., thin-bedded, bryazoans (2-500')
5) Applied in E. Central Arizona. Approx. equiv. of Toroweap fm. and De Chelly ss.

Sonsela sandstone bed, Petrified Forest mbr. (Chinle) — U. Triassic
1) E. Black Mesa basin
2) J. P. Akers, W. E. Cooley, and C. A. Repenning, 1958, N. M. Geol. Soc. Gdbk.
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 Petrified 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')
5) Gregory assigned to Chinle. Callahan, 1951, assigned to Wingate. Harshbarger et al., 1957, U.S.G.S., P. P. 291, assigned to Moenave fm. as Springdale sandstone member (Wingate)

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
2) N. H. Darton, 1910, U.S.G.S. Bull. 435, pp. 22-25
3) Supai village, on Cataract Creek, N. Arizona
4) Red ss. & shs. & purplish lss. (approx. 500')
5) Equiv. to part of Cutler fm. (marine & continental)

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.S./ Jet. Little Colorado River-Grand Canyon
4) Purp. & cream ls. & ss. (0-100')
5) Applied in Central Navajo country. Approx. equiv. of Elbert, Aneth & Martin fms. of Four Corners

Timpoweap 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., ls. & 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
2) G. K. Gilbert, 1874, Phil. Soc. Wash. Bull., vol. 1, p. 109
3) Tonto Creek trib. of Salt River, Arizona
4) Ls., mot., aren. sh., vitreous ss. (800'+ or —)
5) Applied in Central Navajo country. Members: Muav ls., Bright Angel sh., Tapeats ss.

Toreva formation (Mesaverde) — U. Cretaceous
1) Rim Rock (basal mbr.) of Black Mesas
2) Repenning & Page, 1956, A.A.P.G. vol. 40, no. 2
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

(O) Toroweap formation (Aubrey group) — Permian
1) Nevada, S.W. Utah, N.W. Arizona
2) E. D. McKee, 1937, Carnegie Instit. Wash. Pub. #492, pp. 341-43
3) East wall Toroweap Valley, Arizona
4) Red beds (2) sep. by mass. ls.
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
2) Repenning & Page, 1956, A.A.P.G., vol. 40, no. 2
3) Pinyon, Arizona
4) Interbed. arkose ss., shs. & coal (656')
5) Thins northward on Black Mesa, intertongues with Toreva, correlative with Crevasse Canyon in San Juan Basin

Westwater Canyon sandstone member (of Morrison fm.) — U. Jurassic
1) Four Corners area
2) H. E. Gregory, U.S.G.S. P. P. 188
3) Westwater Creek, San Juan County, Utah
4) Lt. gr. sss. & red sdy. shs. & gr. cgl. (0-300')
5) Underlies Brushy Basin sh. & overlies Recapture sh. (continental)

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 Quad.
4) Fluviatile, ang. frag. diabase & ls.
5) Applie din E. Central Arizona. Older than Gila cgl. & younger than Globe ls.

Wingate sandstone — U. Triassic
1) N.W. New Mexico, N.E. Arizona, S.E. Utah — W. Colorado
2) C. E. Dutton, 1885, U.S.G.S. 6th Ann. Rept. pl. 16, p. 136
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)

Wupatki member (Moenkopi) — L. Triassic
1) Southern & Western Black Mesa basin
2) E. D. McKee, 1954, Geol. Soc. Amer. Mem. 61
3) Wupatki Nat. Mon., Arizona
4) Interbed., mass. ss., thin-bed. slst. & crumbly mdst.
5) Applied in Central Navajo country. Lower mbr. Moenkopi w/some Kaibab ls. cgl.

Yale Point sandstone (Mesaverde) — U. Cretaceous
1) Yale Point to South Rim - Black Mesa
2) Repenning & Page, 1956, A.A.P.G., vol. 40, no. 2
3) Yale Point on Black Mesa
4) Cse. to med. ss., x-bed.,. lenticular (300')
5) Thins southward, intertongues with Wepo fm.