DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS INVESTIGATIONS SERIES
MAP I-1407

CORRELATION OF MAP UNITS

- Qa, Qe, Qtc, Ql, Qoa — Holocene, Pleistocene — QUATERNARY
- UNCONFORMITY
- Tbp — Miocene — TERTIARY
- UNCONFORMITY
- Tb — Oligocene — TERTIARY
- UNCONFORMITY
- Kms, Kmf, Kmm, Kd — Upper Cretaceous; Lower Cretaceous — CRETACEOUS
- UNCONFORMITY
- KJcm — Lower Cretaceous; Upper Jurassic
- UNCONFORMITY
- Jsr — Upper Jurassic — JURASSIC
- UNCONFORMITY
- Jsc — Upper Jurassic
- UNCONFORMITY
- Je, Jca — Middle Jurassic
- JTRg — Lower Jurassic and Upper Triassic
- UNCONFORMITY
- TRc, TRcg — Upper Triassic — TRIASSIC
- UNCONFORMITY
- TRm — Lower Triassic
- Pp (Ppu, Ppl) — PERMIAN
- PROBABLE UNCONFORMITY
- ℙw, ℙmu, ℙml — Middle Pennsylvanian — PENNSYLVANIAN
- ℙrv — Lower Pennsylvanian
- Mdh — Upper Mississippian — MISSISSIPPIAN
- POSSIBLE UNCONFORMITY
- Mm — Lower Mississippian
- UNCONFORMITY
- OЄd (INTRUSIVE CONTACT) — Lower Ordovician or Upper Cambrian — ORDOVICIAN OR CAMBRIAN
- Єl — Upper Cambrian — CAMBRIAN
- ANGULAR UNCONFORMITY
- Yu, Yus — PROTEROZOIC Y

DESCRIPTION OF MAP UNITS

Qa ALLUVIUM (HOLOCENE)—Gravel, sand, and silt, poorly sorted, subangular to rounded, cobbly and bouldery, but well sorted in some river bars. Includes floodplain deposits, islands and bars in river channels, bouldery debris fans and alluvial fans, and silty sandy gravel fills along minor tributaries. Humic zones toward tops of some deposits. Grades into colluvium. Maximum thickness a few tens of meters

Qe EOLIAN SAND (HOLOCENE)—Sand, fine- to medium, well-sorted, well-rounded. Mostly patchy, semistable sheet-like deposits but includes active dunes, especially in the Vermillion Creek-Conway Draw area east of Lodore Canyon. Derived chiefly from Weber Sandstone, Glen Canyon Sandstone, and Browns Park Formation. Locally intermixed with alluvium. Many small patches unmapped. Maximum thickness a few meters

Qtc TALUS AND UNDIFFERENTIATED COLLUVIUM (HOLOCENE AND PLEISTOCENE)—Talus: accumulations of coarse angular rock fragments below cliffs and steep slopes. Colluvium: heterogeneous mixes of soil (engineering sense) and rock; grades into alluvium. Maximum thickness a few tens of meters

Ql LANDSLIDE DEPOSITS (HOLOCENE AND PLEISTOCENE)—Rock fragments and soil (engineering sense), very heterogeneous, locally including blocks and (or) slabs of rock many meters long. Grades into colluvium. Maximum thickness several tens of meters

Qoa OLDER ALLUVIUM (PLEISTOCENE)—Gravel and sand, commonly cobbly to bouldery, capping terraces and pediments of several different ages at varied heights above present drainage and including old fills in interstream areas. Some valleys contain as many as 5 terrace levels. A deposit in Secs. 12 and 13, T. 9 N., R. 103 W., Moffat County, CO fills an old high-level channel of the Green River. Locally includes unmapped eolian sand. On East Cactus Flat near head of Yampa Canyon includes small hills of bouldery cobble gravel that may be remnants of Bishop Conglomerate. Maximum thickness probably a few meters

Tbp BROWNS PARK FORMATION (MIOCENE)—Sandstone (predominant), white to very light yellowish or greenish gray, calcareous to tuffaceous, fine- to coarse-grained, friable, commonly crossbedded; tuff (abundant), vitric pearly gray to earthy dull white, rhyolitic, commonly crossbedded; limestone (subordinate), white, slightly sandy, underlying John Weller Mesa and Limestone Hill; conglomerate (rare in map area), pink, pebbly to cobbly, locally derived subangular to subrounded stones. Top eroded; base very uneven; thickness highly varied—from a wedge edge to 290 m in Sec. 30, T. 9 N., R. 101 W., Moffat County, CO (S. J. Luft, U.S. Geological Survey, written commun., 1980)

Tb BISHOP CONGLOMERATE (OLIGOCENE)—Conglomerate and coarse stony sandstone, very light gray to pinkish gray to tan, very poorly sorted, loosely cemented, pebbly to cobbly to bouldery. Locally derived stones, subangular to subrounded, chiefly from Paleozoic limestones and Proterozoic Uinta Mountain Group. Pebble-size red chert common. Many boulders exceed a meter across, some >2 m. Contains light-gray hornblendic biotitic tuff on Diamond Mountain, Yampa Plateau, and along Mud Springs Draw south of Round Top Mountain. Caps mesas and fills old valleys. Thickness highly varied; from a wedge edge to perhaps 150 m on Diamond Mountain and 60 m along Harpers Corner road and on Klauson Pasture near head of Yampa Canyon

MANCOS SHALE (UPPER AND LOWER CRETACEOUS)

Kms Main body (Upper Cretaceous)—Shale, dark gray, silty to clayey, generally calcareous, expansive, marine; weathers light gray to light yellow. Subordinate siltstone, sandstone (in upper half) and layered bentonite (in lower half). A few thin beds of limestone in lower part. Locally fossiliferous. Forms slopes, valley bottoms, and badlands. Incomplete in map area but as thick as 1,550 m in adjacent areas (Walton, 1944; Thomas and others, 1945; Kinney, 1955; Dyni, 1968)

Kmf Frontier Sandstone Member (Upper Cretaceous)—Upper part: Sandstone, light-brown to light greenish gray, thin-bedded to massive, calcareous, locally crossbedded, ripplemarked; marine fossils, coal. In westerly area contains a medial shale as much as 15 m thick. Lower part: Shale, and siltstone, dark-gray, weathers light yellowish gray, calcareous, silty, fossiliferous. Upper part forms hogbacks and flatirons; lower part forms slopes and saddles. Near Dinosaur Quarry, upper part is 44 m thick and lower part is 24 m (Untermann and Untermann, 1968); near Deerlodge Park upper part is 24 m thick and lower part is 40 m.

Kmm Mowry Shale Member (Lower Cretaceous)—Shale, dark-gray, hard, siliceous, fissile, abundant fish scales; weathers silvery gray. Beds of bentonite. Forms slopes and strike valleys. Thickness about 10-65 m in western part of area, 10 m in eastern part

Kd DAKOTA SANDSTONE (LOWER CRETACEOUS)—Sandstone, light-gray to light-yellow, medium- to coarse-grained, pebbly, crossbedded, rippIemarked, fluviatile; subordinate chert-pebble conglomerate and dark-gray shale. Forms hogbacks and dipslopes. Thickness highly varied, 12-30 m

KJcm CEDAR MOUNTAIN FORMATION (LOWER CRETACEOUS) AND MORRISON FORMATION (UPPER JURASSIC) UNDIFFERENTIATED—Claystone and siltstone, variegated red, lavender, gray, green, and yellow, and interbedded fine- to coarse-grained gray lenticular fluviatile sandstone. Lavender tints are prevalent in the Cedar Mountain Formation; the discontinuous but distinctive chert-pebble Buckhorn Conglomerate Member marks its base. Nonmarine. The Morrison Formation also contains lenticular fluviatile conglomeratic sandstone, including the renowned dinosaur-bearing beds at the fossil quarry, and fresh-water limestone. Lower beds of the Morrison are shaly except for a 6- to 15-m thick sandstone (correlated with Windy Hill Member of the Sundance Formation) at the base (Pipiringos, 1968). Claystone, siltstone, and shale are regarded as overbank floodplain deposits. Unit forms slopes and is slide prone. Cedar Mountain Formation is 30-60 m thick at the quarry area and Morrison Formation is about 260 m

STUMP FORMATION

Jsr Redwater Member (Upper Jurassic)—Siltstone and shale, light-green to olive-green, soft, fissile, glauconitic, marine, sparse interbeds of tan, lavender, or greenish gray crossbedded glauconitic oolitic fossiliferous marine limestone and sandstone. Forms slopes. Thins from about 40 m in western part of Monument to 22-27 m in eastern part.

Jsc Curtis Member (Middle Jurassic)—Sandstone, light-gray to light-greenish gray, thin- to medium-bedded, cross-bedded, medium- to coarse-grained, locally ripplemarked, fossiliferous, marine. Forms ledges. Thins from about 15-30 m in westernpart of area to 7 m at Deerlodge Park

Je ENTRADA SANDSTONE (MIDDLE JURASSIC)—Sandstone, mostly pink but in some places yellowish gray, fine- to medium-grained, thick-bedded, cross-bedded, eolian. Forms cliffs. Thins unevenly eastward from 50 m or more near Dinosaur Quarry to about 12 m near Calico Draw south of Deerlodge Park

Jca CARMEL FORMATION (MIDDLE JURASSIC)—Shale, siltstone, and mudstone, dark-red, sandy, marine; some fine- to medium grained sandstone; a few thin beds of marine limestone. Forms slopes and saddles. About 30-40 m thick in western part of Monument but pinches out eastward and is nonexistent at Deerlodge Park

JTRg GLEN CANYON SANDSTONE (LOWER JURASSIC AND UPPER TRIASSIC)—Sandstone, mostly pink but light-gray to grayish yellow in some areas, mostly fine-grained. Large-scale eolian crossbedding predominant, but flat bedding increases towards base. Eolian sands deposited by winds that blew from north and northeast (Poole, 1962). Forms large sculptured outcrops, occasional cliffs. Equivalent to Nugget Sandstone of adjacent areas and partly equivalent to Navajo Sandstone. Thickness about 180-200 m

CHINLE FORMATION (UPPER TRIASSIC)

TRc Main body—Siltstone, shale, sandstone, and conglomerate, varicolored red (predominant) and gray, fluviatile; lacustrine or paludal ocherous marlstone, sandstone, and conglomerate 10-25 m above base correlate with the Popo Agie Member of the Chugwater Formation. Forms slopes. About 80 m thick.

TRcg Gartra Member—Sandstone, pale yellowish gray to tan to pink, coarse-grained to conglomeratic, generally thickly bedded crossbedded, fluviatile. Truncates and channels underlying Moenkopi Formation. Forms cliffs, benches, and rimrocks. Maximum thickness about 30 m, but member is nonexistent locally

TRm MOENKOPI FORMATION (LOWER TRIASSIC)—Siltstone and shale, varicolored red (predominant) to green and gray; reddish brown to chocolate-colored interbeds, overall color being moderate reddish orange; gypsiferous toward base and in middle section; ripplemarks. Shoreward marine, possibly a tidal-flat deposit. Forms slopes, but a few resistant siltstone beds near middle form ledges or low cliffs. Ranges in thickness from 240 m at Split Mountain to 171 m at Disappointment Draw

Pp PARK CITY FORMATION (PERMIAN)—Undivided in some areas of poor exposure. Marine.

Ppu Upper unit—Limestone, siltstone, sandstone, and dolomite, mostly nonresistant, light-gray, light yellowish gray to greenish gray, thin-bedded, locally fossiliferous, marine. Ledge-forming phosphatic dolomite or limestone bed 3-10 m below top (Schell and Yochelson, 1966). Correlated by Schell and Yochelson with upper part of Franson Member of Park City Formation. Forms slopes. About 10-21 m thick

Ppl Lower unit—Sandstone, dolomite, and limestone, light grayish brown, cherty (light gray), locally phosphatic, unevenly bedded, locally fossiliferous, marine. Resistant, forms long dipslopes and caprocks on cliffs. In places sharply truncates crossbedding of underlying Weber Sandstone; in other places contact is vague. Correlated by Schell and Yochelson (1966) with the lower part of the Franson Member and with the Meade Peak Phosphatic Shale Member of the Phosphoria Formation. About 10-14 m thick

ℙw WEBER SANDSTONE (MIDDLE PENNSYLVANIAN)—Sandstone, light gray to light yellowish gray, mostly fine to very fine grained, very thickly bedded. Large-scale eolian crossbeds separated by diastems; eolian sands deposited by winds that blew chiefly from the north (Fryberger, 1979). Permian (Wolfcampian) Foraminifera reported near the top of the formation in Split Mountain area (Bissell, 1964; Bissell and Childs, 1958). Rugged outcrops; the prime cliff-former in Dinosaur National Monument. About 330 m thick at Morris Ranch (Bissell and Childs, 1958), 280 m at Sand Canyon (Fryberger, 1979), and 350 m at Hells Canyon (Bissell and Childs, 1958); at Deerlodge Park is 281 m according to Bissell and Childs but is 232 m according to Fryberger

MORGAN FORMATION (MIDDLE PENNSYLVANIAN)

ℙmu Upper member—Sandstone (predominant) red, fine-grained, crossbedded to planar bedded to massive, well-cemented, and limestone, gray to pale-lavender, cherty fossiliferous marine. Chert is pink to dark red. Locally some sandstone is gray and Weber-like. Individual beds <1 m to several meters thick. Total thickness about 175 m at Split Mountain and 150 at east end of Yampa Canyon, but lower contact is generally poorly exposed and is indefinite where well exposed

ℙml Lower member—Shale and siltstone, light-gray (predominant), red, and green, and interbedded gray sandstone and gray to lavender fossiliferous marine limestone. Forms slopes and is commonly mantled with colluvium; slide prone. About 40 m thick at Split Mountain and 90 m at Hells Canyon and head of Yampa Canyon, but contacts are mostly poorly exposed

ℙrv ROUND VALLEY LIMESTONE (LOWER PENNSYLVANIAN)—Limestone, light-gray to pale-lavender, fine-grained, thick-bedded, cherty, fossiliferous, marine, and thin partings of gray to red shale. Pink to red chert in nodules and irregular masses, occasionally replacing fossils. Forms cliffs, ledges, and long dipslopes. About 65-95 m thick in Split Mountain area, 100 m at Hells Canyon, and 120 m at head of Yampa Canyon, but contacts are generally poorly exposed

Mdh DOUGHNUT SHALE AND HUMBUG FORMATION (UPPER MISSISSIPPIAN)
Doughnut Shale—Shale, dark-gray clayey (predominant) and red toward base. Largely marine, but contains nonmarine deposits in adjacent areas. Poorly exposed; plastic when wet, slide prone.
Humbug Formation—Sandstone, light-gray to red, fine-grained to very fine grained, interbedded with light-gray marine limestone and red to black shale. Hematitic sandstone at top at Iron Mine Ridge; mustard-colored sandstone at top in Bear Valley area. Forms ledgy slopes, but locally makes good cliff exposures near Bowers Draw in Yampa Canyon. Combined thickness of Doughnut and Humbug is about 75-90 m

Mm MADISON LIMESTONE (LOWER MISSISSIPPIAN)—Limestone, light-gray to dark-gray to tan, fine- to medium-grained, thick-bedded and unevenly bedded; nodular gray chert; locally dolomitic, sparsely fossiliferous, marine. Forms massive cliffs, ledgy toward top, and dipslopes. Locally is cavernous. About 180-200 m thick

OЄd DIKE (LOWER ORDOVICIAN OR UPPER CAMBRIAN)—Leucitite, medium dark gray, slightly brownish, aphanitic, slightly microporphyritic (<3 percent phenocrysts of potash feldspar about 1 mm long). Ground mass crowded with disseminated hematite, rutile, and anatase (George A. Desborough, U.S. Geological Survey, written commun., 1979). Thin amygdaloidal zones parallel to walls; highly sheared borders. Very fine grained black dikelets cut the main dike. Exposed in side ravine in west wall of Lodore Canyon 0.55 km up river from mouth of Pot Creek. Emplaced at a depth of about 1,200 m, the restored thickness of strata above the dike at the time of its emplacement. The only known dike in Dinosaur National Monument. Maximum measured thickness 23 m

Єl LODORE FORMATION (UPPER CAMBRIAN)—In Lodore and Whirlpool Canyons: At the top, sandstone, light-brown to greenish-gray, ledge-forming, as much as 15 m thick, underlain by pink to tan to greenish gray glauconitic fossiliferous (mostly brachiopods) slope-forming shale interbedded with tan to pale-green, ledge-forming glauconitic marine sandstone. As much as 50 m thick. Below the shaly unit is variegated pink to gray to pale-green, coarse- to medium-grained pebbly transgressive marine sandstone; forms cliffs (i.e. Dunns Cliff) and is about 85 m thick. The basal contact is very uneven, and in Whirlpool Canyon boss-like masses (fossil sea stacks) of Uinta Mountain Group protrude up into the formation. Total thickness of formation in Lodore and Whirlpool Canyons is as much as 180 m. Elsewhere the upper shaly unit has been wholly or partly removed by pre-Mississippian erosion and the thickness of the formation varies accordingly. Minimum thickness probably is about 70 m at Blue Mountain

UINTA MOUNTAIN GROUP (PROTEROZOIC Y)—The exposed thickness of the Uinta Mountain Group in the Lodore Canyon area is about 2700 m, but the base is unexposed. Thicker sections including the base are exposed on the northeast flank of the Uinta Mountains north of Dinosaur National Monument (Hansen, 1965, p. 33).

Yu Sandstone—Light to dark red, coarse to medium grained, pebbly, quartzitic, crossbedded, fluviatile. Grains subangular to sub-rounded, cemented by quartz overgrowths and (or) hematite. Occasional beds of pebble conglomerate; pebbles, gray to pink quartz and metaquartzite. Occasional beds of red to gray silty shale and (or) siltstone with micaceous bedding planes. Forms cliffs and ledges.

Yus Shale (predominant) and sandstone—Shale, gray, pale olive green, and red, very evenly bedded, with micaceous bedding planes, and (or) siltstone, interbedded with fine- to coarse-grained red sandstone. At several horizons in the Uinta Mountain Group. Forms slopes. Shale sampled in the NE1/4sec. 6, T. 7 N., R. 100 W. about 2.4 km south of Greystone, Colo. has a radiometric age of 1,090 ± 50 m.y. (Whole-rock rubidium-strontium age determined by Sambhudas Chandhuri, Kansas State University, written commun., 1980)

CONTACT

FAULT—Dashed where approximately located; dotted where concealed; querried where doubtful
High angle—Showing dip; ball and bar on downthrown side
Low angle reverse—Sawteeth on upper plate

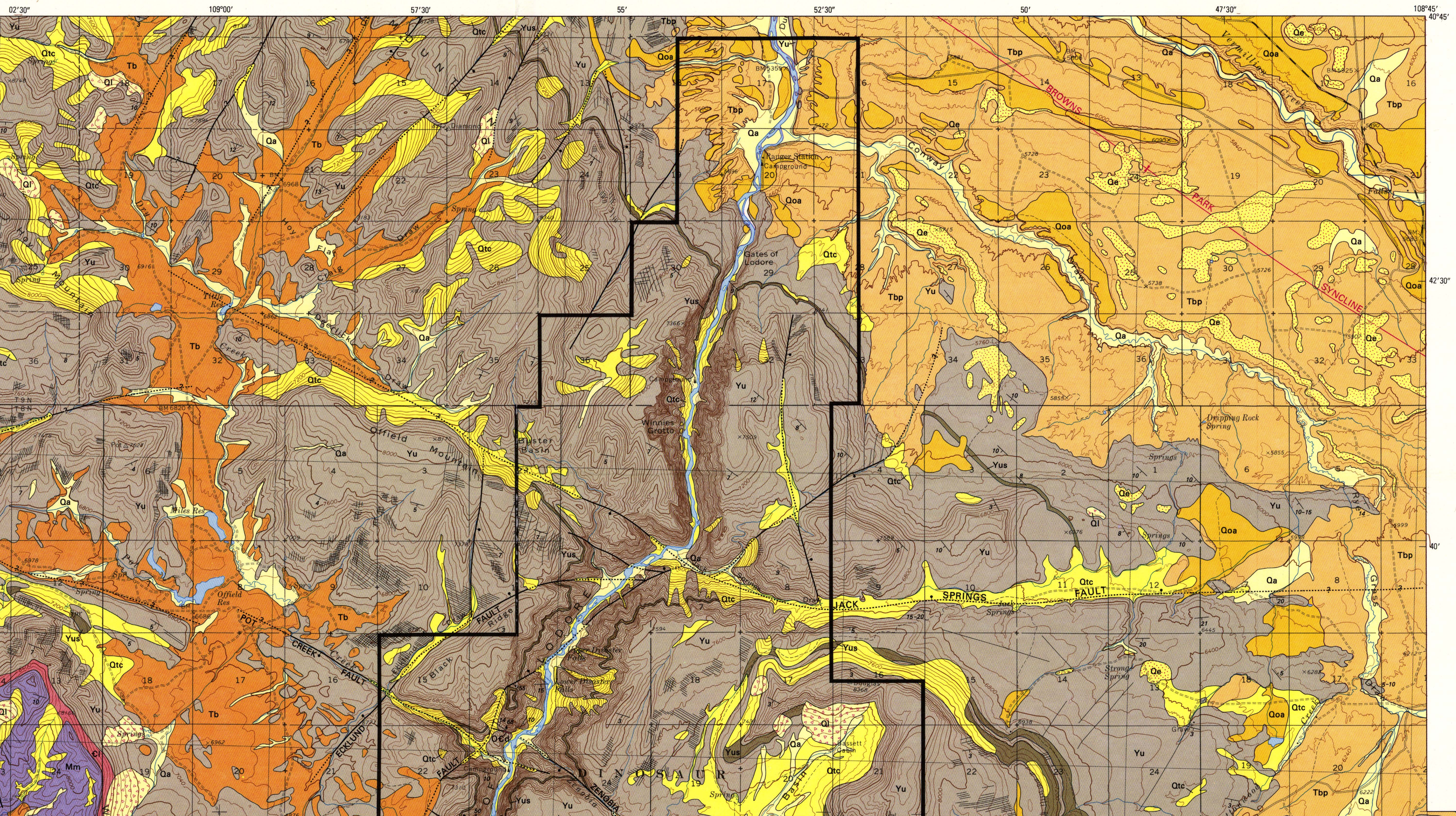
FOLD AXES—Showing trace of axial plane. Dashed where approximately located; dotted where concealed
Anticline—Showing direction of plunge
Asymmetrical anticline—Shorter arrow indicates steeper limb
Syncline—Showing direction of plunge
Asymmetrical syncline—Shorter arrow indicates steeper limb
Anticlinal bend of monocline
Synclinal bend of monocline

STRIKE AND DIP OF BEDS
10 Inclined
90 Vertical
85 Overturned
Horizontal

TRACES OF MASTER JOINTS

EROSIONAL SCARP—At terrace margin separating alluvial deposits at different levels

Dinosaur National Monument boundary



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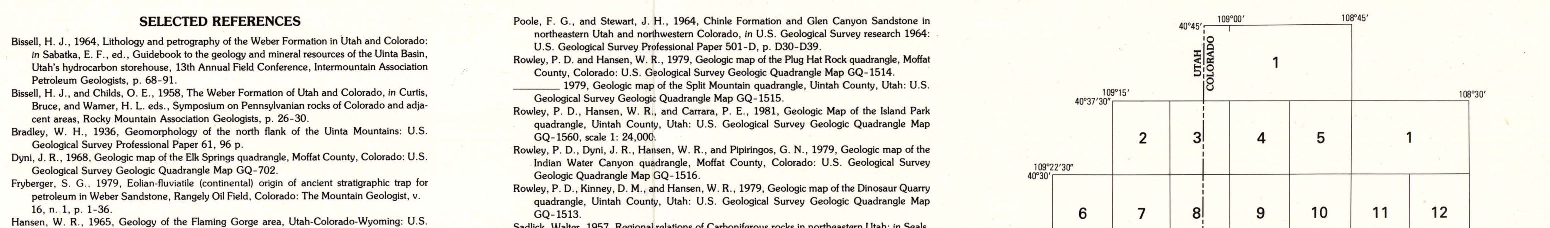

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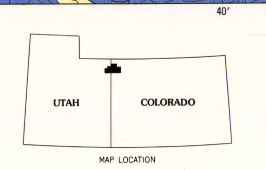
Base from U.S. Geological Survey, Moffat County, Colorado, 1:50,000, 1975; Jones Hole, Stuntz Reservoir, Utah–Colorado, 1:24,000, 1955; Island Park, Split Mountain, Utah, 1:24,000, 1955; Dinosaur Quarry, Utah, 1:24,000, 1965

SCALE 1:50 000
1 ½ 0 1 2 3 MILES
1 .5 0 1 2 3 KILOMETERS

CONTOUR INTERVAL 40 AND 80 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
DOTTED LINES CROSSING RIVERS REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

GEOLOGIC MAP OF DINOSAUR NATIONAL MONUMENT AND VICINITY, UTAH AND COLORADO

By
Wallace R. Hansen, Peter D. Rowley, and Paul E. Carrara
1983



MAP LOCATION

☆INTERIOR—GEOLOGICAL SURVEY, RESTON, VA.—1983—G81359

Geology compiled by Wallace R. Hansen, 1980, from 1:24,000 scale Geologic Quadrangle Maps listed in selected references, with minor revisions, and from unpublished mapping by the authors in the Hoy Mountain quadrangle, Utah–Colorado; Canyon of Lodore North, Jack Springs, Greystone, and Limestone Hill quadrangles, Colorado

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