Base from U.S. Geological Survey
7½-minute quadrangle.

CGS OF-78-4
PLATE 1 OF 7
EXPLANATION OF MAP IS PLATE 7

SURFICIAL GEOLOGY OF THE GRAY RESERVOIR QUADRANGLE

BY

WALTER R. JUNGE

1978

Base from U.S. Geological Survey
7½-minute quadrangle.

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

CGS OF-78-4
PLATE 2 OF 7
EXPLANATION OF MAP IS PLATE 7

SURFICIAL GEOLOGY OF THE BOWIE QUADRANGLE

BY

WALTER R. JUNGE

1978

BASE FROM U.S. GEOLOGICAL SURVEY
7½-MINUTE QUADRANGLE.

SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

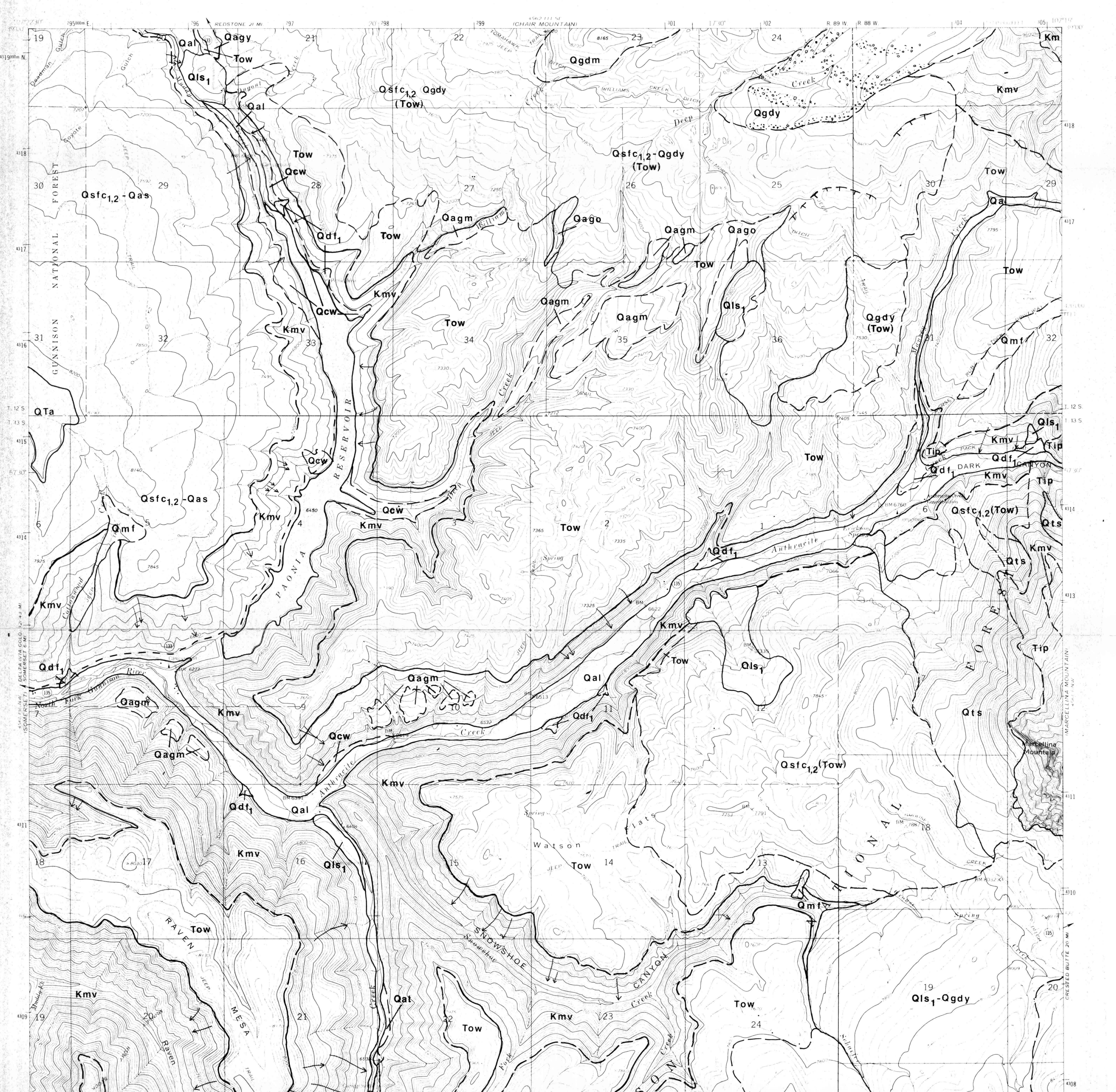
GN MN 1°32' 27 MILS 14° 249 MILS

UTM GRID AND 1964 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

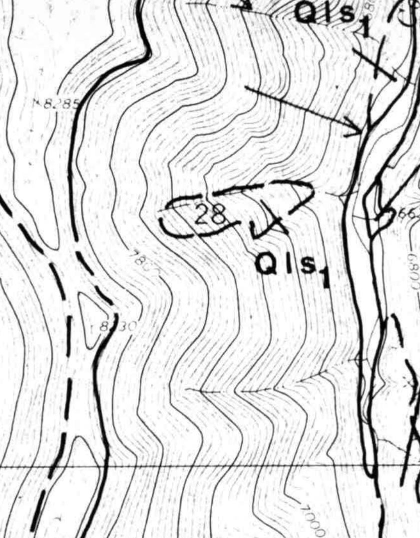
CGS OF-78-4
PLATE 3 OF 7
EXPLANATION OF MAP IS PLATE 7

SURFICIAL GEOLOGY OF THE SOMERSET QUADRANGLE

BY
WALTER R. JUNGE
1978



Base from U.S. Geological Survey
7½-minute quadrangle.



SCALE 1:24000

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

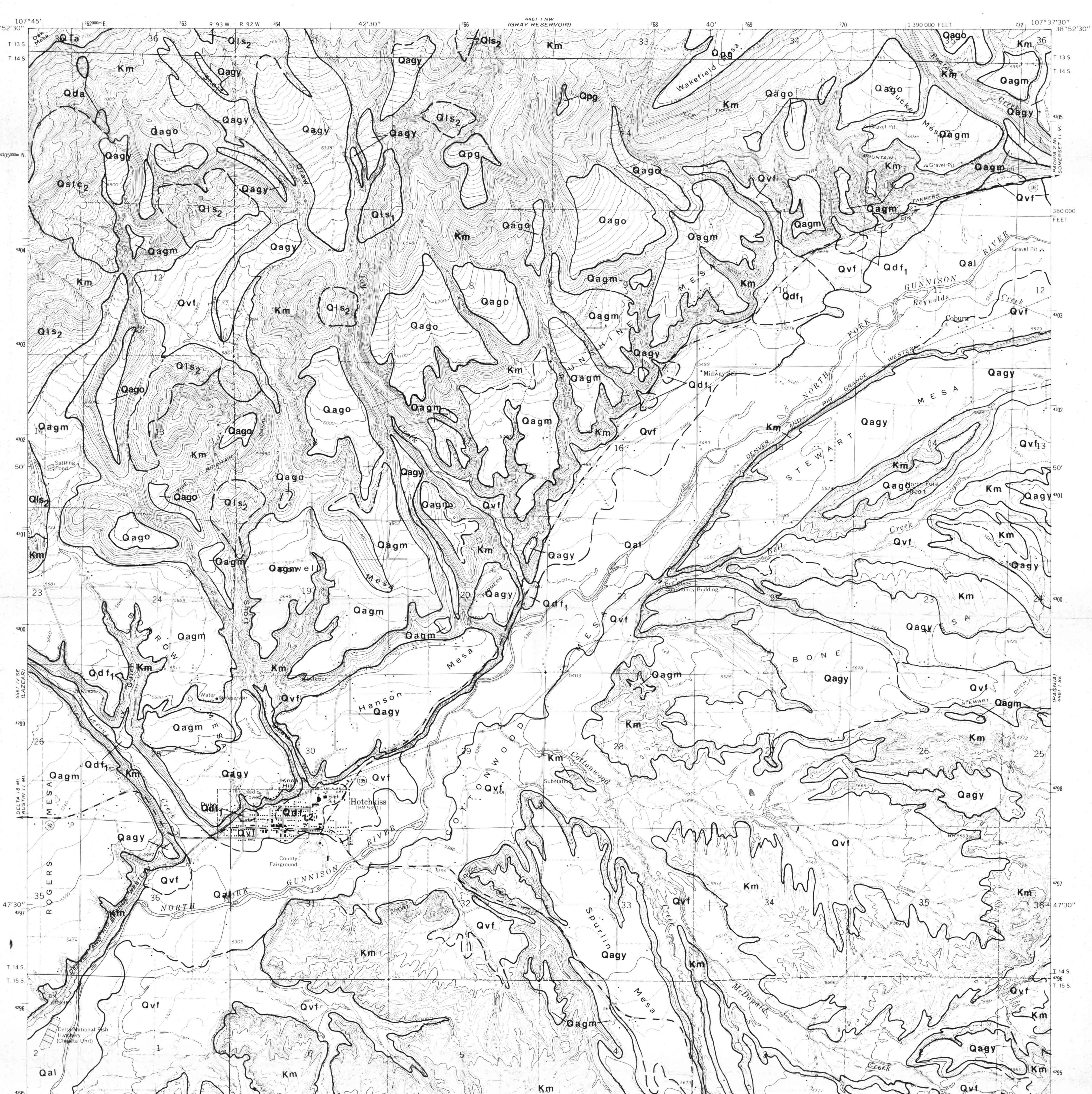
CGS OF-78-4
PLATE 4 OF 7
EXPLANATION OF MAP IS PLATE 7

SURFICIAL GEOLOGY OF THE PAONIA RESERVOIR QUADRANGLE

BY

WALTER R. JUNGE

1978



BASE FROM U.S. GEOLOGICAL SURVEY
7½-MINUTE QUADRANGLE.

CGS OF-78-4
PLATE 5 OF 7
EXPLANATION OF MAP IS PLATE 7

SURFICIAL GEOLOGY OF THE
HOTCHKISS QUADRANGLE
BY
WALTER R. JUNGE
1978

BASE FROM U.S. GEOLOGICAL SURVEY
7½-MINUTE QUADRANGLE.

SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

GN MN

1°36' 29 MILS

14' 249 MILS

UTM GRID AND 1965 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

SURFICIAL GEOLOGY OF THE PAONIA QUADRANGLE

BY

WALTER R. JUNGE

1978

CGS-OF-78-4
PLATE 6 OF 7
EXPLANATION OF MAP IS PLATE 7

OPEN-FILE REPORT 78-4
Plate 7 of 7

SURFICIAL GEOLOGY
HOTCHKISS-PAONIA RESERVOIR AREA
DELTA AND GUNNISON COUNTIES, COLORADO

by WALTER R. JUNGE

1978

Colorado Geological Survey
Department of Natural Resources
State of Colorado
John W. Rold, Director

GENERAL DESCRIPTION

The Hotchkiss-Paonia Reservoir area includes the North Fork Gunnison River valley and its tributary areas in northwestern Gunnison and eastern Delta Counties. Six contiguous 7.5-minute quadrangles are in the study area. They are the Gray Reservoir, Bowie, Somerset, Paonia Reservoir, Hotchkiss, and Paonia quadrangles. The surficial geology of each quadrangle, mapped at 1:24,000, represents the distribution of geologic materials formed during the latest period of geologic time, which is known as the Quaternary Period. These maps of surficial geology show young geologic deposits with common characteristics and identify potentially hazardous geologic conditions. Older bedrock is shown on these maps where surficial deposits are very thin or lacking. A brief general description of hazards associated with the surficial deposits or bedrock is included in the Explanation of Map Units; however, the companion geologic-hazards maps in C.G.S. open-file report 78-12 should be consulted for a more detailed description.

The surficial and bedrock geology maps should be used to determine the general geological setting of any proposed land-use change or development activity. These maps are not intended to be a thorough analysis of all geologic aspects and are not intended to replace detailed field investigations.

The geologic setting of the study area is relatively simple: flat-lying Cretaceous and Tertiary sedimentary rocks are locally intruded by younger igneous rocks. These sedimentary and igneous rocks were sculpted during the late Tertiary and Quaternary by erosional processes that formed the present mesa and mountain landscape. Various thin surficial deposits, probably related to glacial stages, suggest that fluvial and mass-wasting activities were the dominate geomorphic processes in the formation of the present landscape.

Glacial, colluvial, and alluvial deposits are shown on the maps and described in the Explanation of Map Units. The relative age and correlation of these deposits is shown on the chart titled Correlation of Map Units. Glacial deposits include those surficial units that were transported and deposited by ice movement or by glacial meltwaters. Most of these deposits probably are latest Pleistocene in age, although older deposits may be present locally. Alluvial deposits are clay to boulder-size material transported and deposited by running water (fluvial processes). The absolute age of these deposits is unknown; however, the map units are placed in a general time framework based upon available geomorphic evidence. This evidence includes soil development, in-place weathering of igneous-rock fragments, and the position of the deposits above modern streams. Diverse lithology of the deposits, caused by extreme variations in local source areas, makes the age and correlation determinations difficult across the entire mapped area. The age and correlation of these alluvial deposits should be considered only approximate. Colluvial deposits generally are unconsolidated soil and/or rock detritus deposited chiefly by mass-wasting processes. Relative age of these deposits is noted by subscripts that range from 1 to 3 after the map symbol. Deposits with subscript 1 formed during the Holocene; whereas 2 and 3 in part represent late Pleistocene deposits.

EXPLANATION OF MAP UNITS

GLACIAL DEPOSITS

Qgdy Younger glacial deposits (late Pleistocene?): unsorted to poorly sorted, subangular, unconsolidated, pebble to boulder-size detritus in a fine-grained matrix. These deposits form a hummocky topography generally only found above 7500 ft, may be modified by mass-wasting processes, and are potentially unstable especially when underlain by the Wasatch Formation.

Qgdm Middle glacial deposits (middle Pleistocene?): unsorted, subangular, poorly consolidated, bouldery detritus. These deposits usually have a greater amount of weathered igneous-rock fragments and form a more subdued topography than the younger glacial deposits.

Qgdo Older glacial deposits (middle Pleistocene?): unsorted, subangular, poorly consolidated, pebble to boulders size detritus. These deposits are exposed only in the northern part of the Bowie Quadrangle.

ALLUVIAL DEPOSITS

Qal Flood-plain alluvium (Holocene): Mixtures of silt, sand, pebbles, and cobbles recently deposited and/or reworked by fluvial processes. These deposits form the physiographic flood plains of the modern drainage system and are a potential source of sand, gravel, and crushed-rock aggregate.

Qat Stream-terrace alluvium (Holocene): poorly sorted deposits of silt, sand, pebbles and cobbles. These deposits form small terraces that are adjacent to the streams and are less than 10 ft (3 m) above them.

Qvf Valley-fill deposits (Holocene to late Pleistocene): fine-grained materials usually deposited by sheet-flow or mudflow processes. These deposits, including alluvial fan landforms, generally form gently sloping surfaces which are incised by the modern streams. Largely derived from Mancos Shale, these deposits may be subject to expansion or hydrocompaction upon wetting, may contain corrosive water, and are prone to sheetflood erosion and mudflow deposition.

Qas Slope-wash debris (Holocene to late Pleistocene): generally fine-grained soil and rock detritus transported and deposited by running water that is not confined to channels. These deposits form a relatively thin veneer over older surficial deposits or bedrock, may include some wind-blown (eolian) material, and may be easily eroded if protective vegetation is removed.

Qagy Younger alluvial gravels (late Pleistocene?): poorly sorted, rounded to subrounded, unconsolidated pebbles and cobbles in a matrix of sand and silt. These gravels vary greatly in composition because of local conditions and they cap the first well-defined terrace above modern streams. Sheet flooding, erosion, and local swelling soils are important geologic conditions associated with these gravels.

Qagm Middle alluvial gravels (middle Pleistocene?): poorly sorted, rounded to subrounded, poorly consolidated gravels in a fine-grained matrix. These gravels have a better developed soil profile and a greater amount of weathered igneous-rock fragments than the younger alluvial gravels. Middle gravels, including alluvial-fan and river-terrace materials, form nearly planar surfaces situated at two or more levels and are subject to sheet flooding and erosion.

Qago Older alluvial gravels (middle Pleistocene?): poorly sorted, rounded to subrounded, poorly consolidated gravels in a fine-grained matrix. These older gravels have a slight increase in consolidation, slightly greater weathering of igneous detritus, and a greater accumulation of calcium carbonate in the C horizon than the younger gravels. The deposits are subject to sheet flooding and erosion.

Qpg Pediment gravels (early Pleistocene): poorly sorted alluvial gravels deposited on a nearby planar, high-level bedrock surface. These deposits have abundant carbonate accumulation in the C horizon and a higher percentage of weathered igneous-rock fragments than the younger gravels. These gravels are subject to sheet flooding and erosion.

QTa High-level alluvium (Quaternary/Tertiary): bouldery, poorly sorted, alluvial deposits that form nearly planar, gently sloping surfaces high above modern streams. Similarity to deposits previously mapped by Tweto and others (1976) suggest formation during the Tertiary or early Quaternary. These deposits are subject to sheet flooding and erosion.

COLLUVIAL DEPOSITS

Ql_1 Ql_2 Ql_3 Landslide deposits (Holocene to late Pleistocene): a heterogeneous assemblage of unconsolidated soil and/or rock formed by slow to rapid downward and outward mass movement of the material. These deposits, which include earthflows, usually form an irregular, hummocky topography and may have an associated head scarp. Relative age of deposits is noted by subscripts (1 is the youngest). Qls deposits most likely were formed during the Holocene and Qls and Qls deposits in part were formed during the late Pleistocene.

Qmf Mudflow deposits (Holocene): dominantly fine-grained material with associated rock fragments formed by the downslope movement of wet, viscous masses of soil and rock material. These deposits have a gently undulating topography with an incised, braided drainage network. With decreasing viscosity during movement the deposits grade to fluvial sediments and with increasing viscosity grade to slow-moving earthflows.

Qdf_1 Qdf_2 Debris flow deposits (Holocene to late Pleistocene): unsorted, unconsolidated debris of soil, rock, and displaced vegetation deposited where the stream gradient decreases. This gradient decrease most commonly occurs near the confluence of a tributary stream with a larger drainage. These deposits result from the rapid movement and deposition of solid material during intense rainfall or snowmelt runoff. Qdf deposits probably formed during the Holocene; Qdf deposits may have been deposited during the late Pleistocene.

Qsc Soil-creep deposits (Holocene): mixtures of sand, silt, and clay with some larger rock fragments formed by slow, down-slope movements of near-surface materials. These deposits, characterized by a series of small swales and ridges perpendicular to the direction of movement, generally are active and indicate areas with unstable slope conditions.

Qda Debris-avalanche deposits (Holocene): unsorted mixtures of soil and rock material formed by the generally sudden and rapid downslope movement of the debris mass. Usually formed during periods of the intense rainfall, these deposits produce a relatively small, elongate rise that may extend to gently sloping areas below the steep slopes from which the materials originate.

$Qsfc_1$ $Qsfc_2$ $Qsfc_3$ Slope-failure-complex deposits (Holocene to late Pleistocene: unsorted mixtures of soil and rock material formed by various mass-wasting processes including landslides, earthflows, soil creep, and debris avalanches. Not all of these processes form a specific deposit and the age of movement may vary within a particular area. The general age of the unit is noted by subscripts (1 is youngest).

Qts Talus/Scree deposits (Holocene to late Pleistocene): angular, unsorted, pebble to boulder-size fragments that mantle mountain slopes or accumulate at the base of a barren-rock mass. These deposits usually form steep, concave slopes and include talus cones and lobate or tongue-shaped rock glaciers. Mass-wasting processes usually are currently active in the formation of these deposits.

Qcw Colluvial-wedge deposits (Holocene to late Pleistocene): unconsolidated, heterogeneous soil material and rock fragments found near the base of the slope. Formed by gravity-dominated processes, the deposits may be subject to continued mass-wasting.

BEDROCK UNITS

Tb Basaltic intrusive rocks (Miocene): dark gray to black porphyritic intrusive rocks that contain fine-grained phenocrysts of olivine and pyroxene.

Tip Porphyritic intrusive rocks (Miocene and Oligocene): light-gray porphyritic intrusive rocks that vary in composition from quartz monzonite to granodiorite.

Tgr Green River Formation (Eocene): primarily calcareous siltstone and shaley marlstone (Hail, 1972). The formation, obscured by surficial material, is prone to mass-wasting processes.

Tow Ohio Creek-Wasatch Formations (Eocene and Paleocene): variegated (usually red, purple, green, yellow, and gray) mudstone and siltstone with interbedded medium-gray, lenticular sandstone, which is locally conglomeratic. These formations generally are obscured by surficial deposits and are prone to mass-wasting.

Kmv Mesaverde Formation (Upper Cretaceous): brown, gray, and light gray to white sandstone interbedded with dark gray shale. These sedimentary rocks generally form very steep slopes which may be subject to rock-falls and other mass-wasting processes. Commercially important coal beds occur in the lower part of the formation.

Km Mancos Shale (Upper Cretaceous): dark brown to gray, laminated silty shale which is susceptible to erosion and mass-wasting. The shale locally contains swelling clays (montmorillonite) and water corrosive to concrete. Drainages that traverse the Mancos Shale are prone to flash floods and mudflows.

Kdb Dakota-Burro Canyon Formations (Upper to Lower Cretaceous): light gray to brown sandstone, siltstone, and conglomerate with some dark gray shale. The unit forms steep slopes that generally are stable.

MAP SYMBOLS

———— — — — ····· Contact: dashed where approximately located; dotted where concealed.

Strike and dip of beds

Fault: bar and ball on downthrown side.

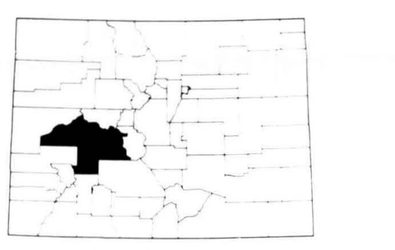
Area of prominent morainal topography

Debris avalanche (Qda)

Recent landslide scarp: hachures point in the direction of the landslide movement.

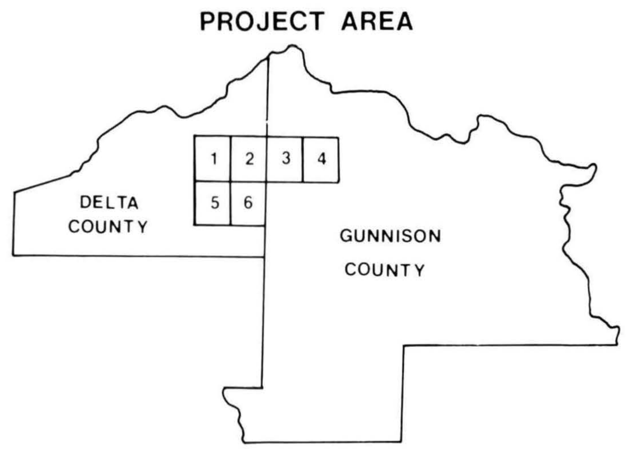
$Qsfc_1$ (Km) Surficial deposits indicated by first symbol. Underlying bedrock indicated by symbol in parentheses.

INDEX MAP



COLORADO

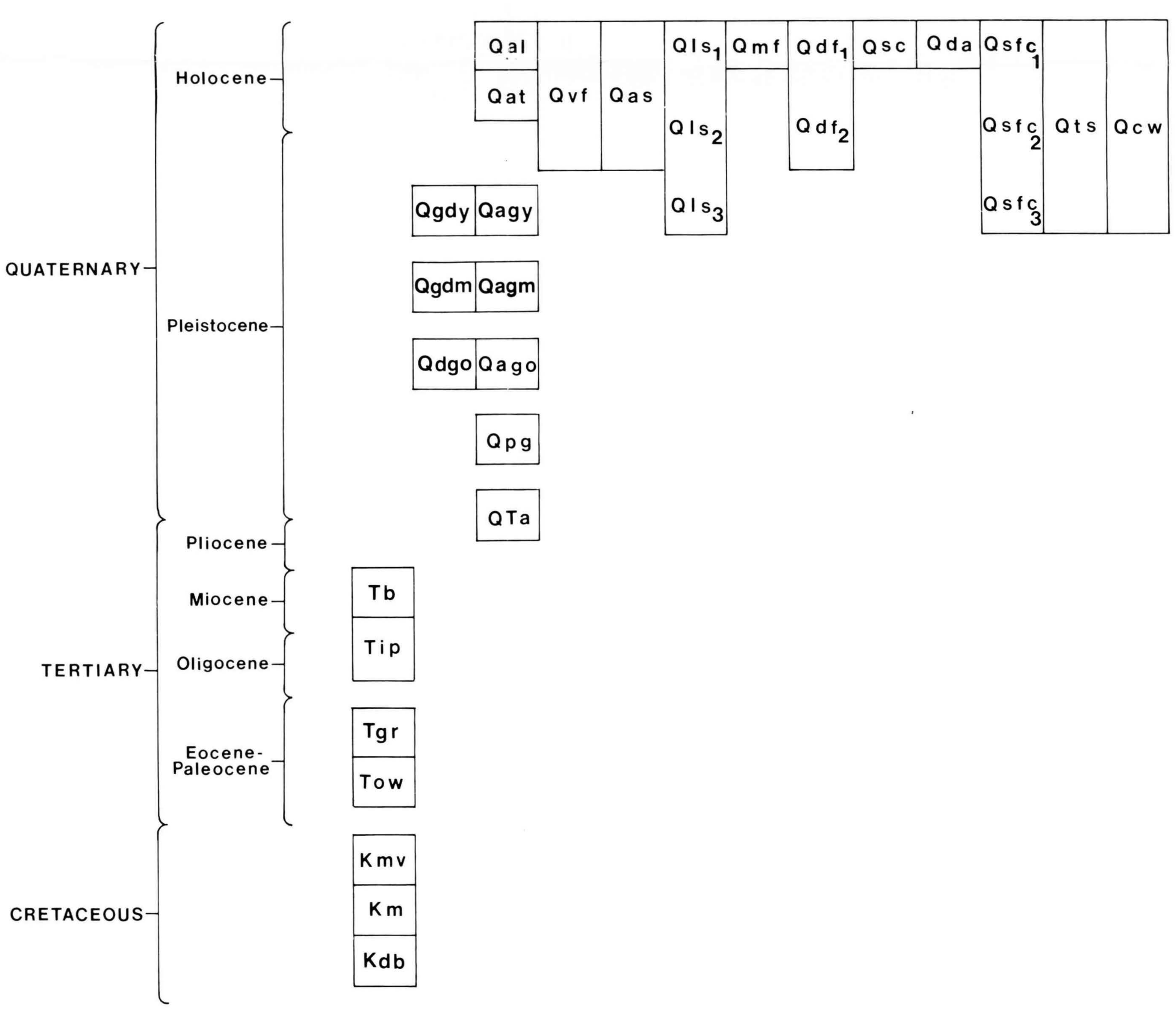
PROJECT AREA



7-1/2 Quadrangles

1. Gray Reservoir
2. Bowie
3. Somerset
4. Paonia Reservoir
5. Hotchkiss
6. Paonia

CORRELATION OF MAP UNITS



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