WYOMING STATE GEOLOGICAL SURVEY
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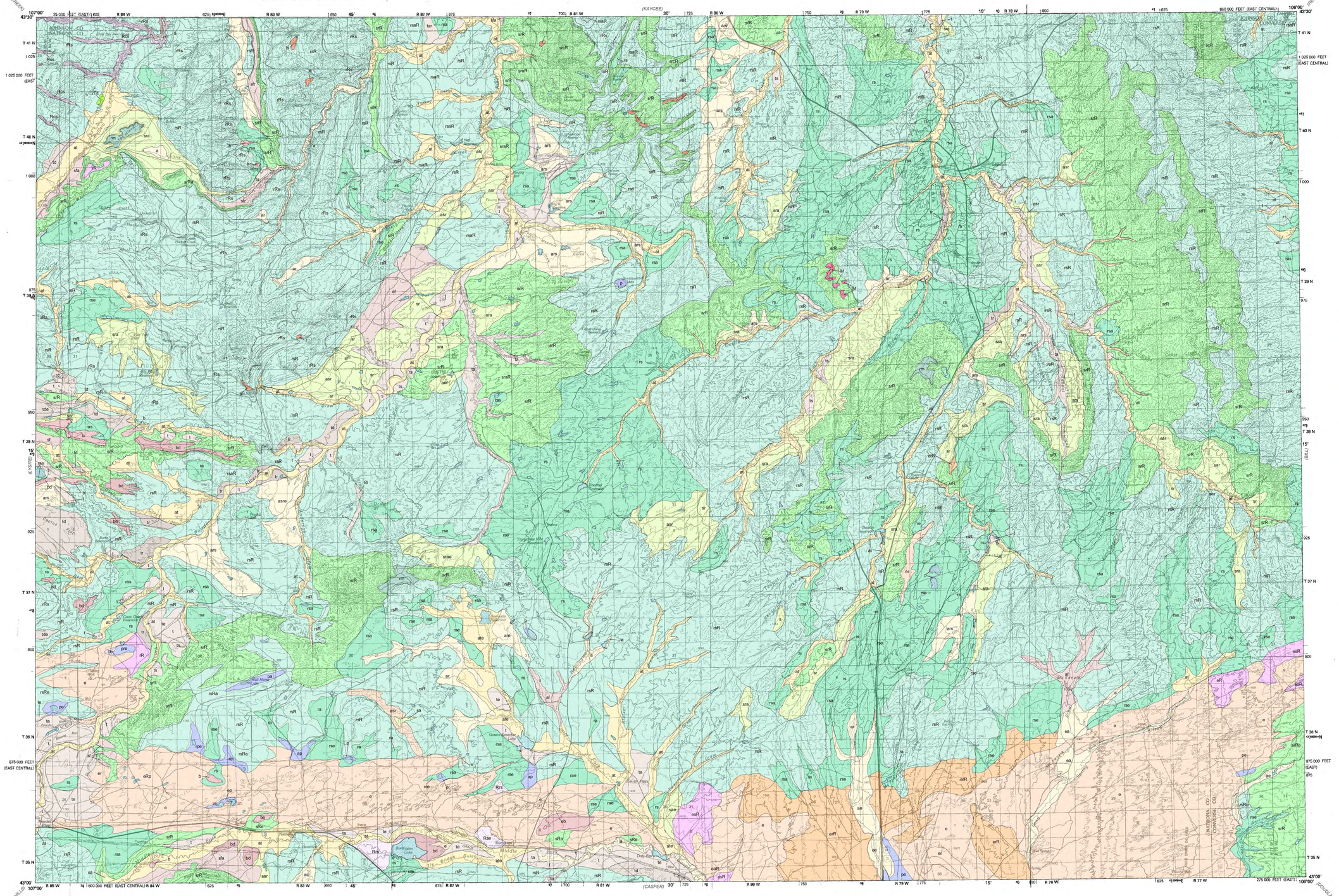
Laramie, Wyoming

Geology - Interpreting the past to provide for the future

USGS science for a changing world

Prepared in Cooperation with the U.S. GEOLOGICAL SURVEY

OPEN FILE REPORT 03-5
Midwest 1:100,000-Scale Surficial Geologic Map



CLASSIFICATION OF MAP UNITS

Alluvial Deposits

Alluvium
Alluvium and alluvium mixed with residuum, eolian deposits, lacustrine deposits, and/or slopewash (101)
(a, ae, ars, ar, are, asre, ea)

Alluvium mixed with terrace deposits, with (scattered) eolian deposits and/or residuum (102)
(at, ate)

Alluvial Fan Deposits
Alluvial fan deposits and alluvial fan deposits mixed with slopewash, alluvium, residuum, and/or eolian deposits (201)
(af, sf, sfa, sfr)

Bench Deposits
Bench deposits and bench deposits mixed with eolian deposits, residuum, and/or slopewash (401)
(b, be, eb)

Dissected bench deposits and dissected bench deposits mixed with slopewash, eolian deposits, and/or residuum (402)
(bd)

Terrace Deposits
Terrace deposits and terrace deposits mixed with alluvium, eolian deposits, residuum, and/or slopewash (601)
(t, ta, tar, te, ts)

Dissected terrace deposits and dissected terrace deposits mixed with slopewash, alluvium, eolian deposits, and/or residuum (602)
(td, tde)

Shallow terrace deposits or shallow terrace deposits/structural terrace mixed with residuum and/or eolian deposits (603)
(tr)

Eolian Deposits
Eolian deposits and eolian deposits mixed with residuum, slopewash and alluvium (701)
(e, eaR, er, esr, eRp)

Eolian deposits mixed with scattered bedrock outcrops or structural terrace/terrace deposits and residuum and/or slopewash (703)
(erR)

Landslide Deposits
Landslides and landslides mixed with slopewash (801)
(l, ls)

Mesa Deposits
Mesa caprock mixed with a thin cover of residuum and/or eolian deposits (901) (rm)

Playa Lake and Playa Lake Deposits
Playa lake, playa lake deposits, and playa lake deposits mixed with eolian deposits, residuum and/or alluvium (1001)
(ep, p, pa, pe, pre, ap, rpe)

Slopewash
Slopewash and slopewash mixed with residuum, alluvium, eolian deposits, alluvial fan deposits, grus and/or colluvium (1101)
(asr, s, sa, sae, sar, scr, sr, sra, srae)

Slopewash mixed with scattered bedrock outcrops and residuum, alluvial fan deposits, alluvium, grus, colluvium, clinker, and/or eolian deposits (1102)
(scR, sfR, sraR, srcR, sRc, srR, srRa, srRe)

Residuum
Residuum mixed with slopewash, alluvium, eolian deposits, and/or alluvial fan deposits (1401)
(rsa, rs, rae, ras, r, ra, rse)

Residuum mixed with scattered bedrock outcrops or structural terrace/terrace deposits and slopewash, alluvium, eolian deposits, alluvial fan deposits, and/or colluvium (1402)
(rRs, rsaR, rsR, rsRa, rsRe)

Bedrock
Bedrock and bedrock mixed with colluvium, alluvial fan deposits, eolian deposits, slopewash, grus, clinker, and/or residuum (1501)
(Rcs, Rr, Rrs, Rse)

Bedrock or upturned truncated bedrock with a thin mantle of eolian deposits, residuum, and/or slopewash (1502)
(esR, rR, eR)

Lake
Water (1601)
(water)

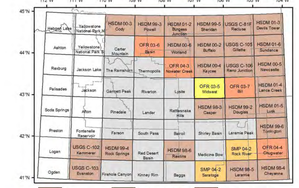
Mined Areas
Mined Areas (1701)
(M)

Structural Terrace/Terrace Deposits
Structural terrace/terrace deposits with a mantle of eolian deposits, residuum, and/or alluvial deposits (1801)
(rT/t)

REFERENCE AND ADDITIONAL INFORMATION FOR CLASSIFICATION OF MAP UNITS

A report to accompany this map is available on request (for hard copy) or in electronic form (for purchasers of this map on CD-ROM: under "DOCUMENTATION" in the main menu, click on "MAP OVERVIEW" report and select a method of viewing and printing the document).

The above report describes the background, GIS methodology, and the mapping classification scheme and description of units used on this map.



INDEX TO 1:100,000 SCALE SURFICIAL GEOLOGIC MAPS OF WYOMING

KEY TO ABBREVIATIONS
Wyoming State Geological Survey maps: Map Series (M), Open File Report (OFR), Preliminary Geologic Map (POM), and unpublished STATEMAP project (SMP).

DISCLAIMERS

Users of these maps are cautioned about using the data at scales different than those at which the maps were compiled—using this data at a larger scale will not provide greater accuracy, and in fact, it is a misuse of the data.

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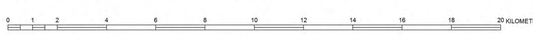
Base map from U.S Geological Survey, 19

Projection: Universal Transverse Mercator (UTM), zone 13
North American Datum of 1927 (NAD 27)
10,000-meter grid ticks: UTM, zone 13
50,000-foot grid ticks: Wyoming State Plane Coordinate System, East zone

UTM GRID CONVERGENCE (GN)
1981 MAGNETIC DECLINATION AT CENTER OF SHEET
DIAGRAM IS APPROXIMATE

WYOMING
QUADRANGLE LOCATION



SCALE 1:100,000
CONTOUR INTERVAL 20 METERS

PRELIMINARY SURFICIAL GEOLOGIC MAP OF THE MIDWEST 30' x 60' QUADRANGLE, NATRONA, CONVERSE, AND JOHNSON COUNTIES, WYOMING

Mapped and compiled by
Laura L. Hallberg and James C. Case

2003

Prepared in cooperation with the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under Cooperative Agreement Number 01HQAG0109.

Digital cartography by Robin W. Lyons, Justin T. Carreno, Justin M. Mulbay, Per Malmberg and Joseph M. Huss.

People with disabilities who require an alternate form of communication in order to use this publication should contact the Editor, Wyoming State Geological Survey. TTY Relay Operator 1 (800) 877-9975.

Additional copies of this map can be obtained from:
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A digital version of this map will be available on CD-ROM.

DIGITAL MAP SERIES 2002-4

PRELIMINARY DIGITAL SURFICIAL GEOLOGIC MAP OF THE MIDWEST 30′ X 60′ QUADRANGLE, NATRONA, CONVERSE, AND JOHNSON COUNTIES, WYOMING

Mapped and compiled by Laura L. Hallberg and James C. Case
Digital cartography by Robin W. Lyons, Justin T. Carreno, and Justin M. Mulbay

WYOMING STATE GEOLOGICAL SURVEY
Lance Cook, State Geologist

Laramie, Wyoming
2002

This report has not been reviewed for conformity with the editorial standards of the Wyoming State Geological Survey.

Prepared in cooperation with the U.S. Geological Survey, National Cooperative Mapping Program, under Cooperative Agreement Numbers 00HQAG0123 and 01HQAG0109.

Preliminary Digital Surficial Geologic Map of the Midwest 30' x 60' Quadrangle, Natrona, Converse, and Johnson Counties, Wyoming

Background

The Preliminary Digital Surficial Geologic Map of the Midwest 30 x 60 Minute Quadrangle shows the surficial features (landforms) and deposits present on the surface in the Quadrangle. The map was primarily generated for a statewide study of aquifer vulnerability to contamination from pesticides. In that context, it was to be used to assist in the generation of a new State soils map, to analyze the effects of the vadose zone on contaminant migration, to define specific Quaternary-age aquifers, and to refine the analysis of regional hydrogeologic settings.

The Preliminary Digital Surficial Geologic Map of the Midwest 30 x 60 Minute Quadrangle can be used, in conjunction with a bedrock geologic map, as a guide in siting new facilities or industries in Wyoming. It can also be used to identify and locate geologic hazards, such as landslides and windblown deposits, or to assist in the search for shallow ground water supplies and for construction aggregate. The map has already been used in the generation of Quaternary Geologic Maps of Wyoming.

Quadrangle Mapping

The mapping was accomplished through the use of limited existing surficial geology maps, existing bedrock geology maps, existing soil surveys, existing landslide maps, existing windblown deposits maps, existing clinker maps, and aerial photography. Most of the Quadrangle had to be newly mapped for surficial geology, which was accomplished by interpreting aerial photography and using existing related references.

Aerial Photography

The aerial photography used to generate the surficial geology map was predominantly U.S. Geological Survey (USGS) National High Altitude Photography (NHAP I, 1980 - 1982). The USGS photography was color infrared at a scale of 1:58,200. In addition, Bureau of Land Management (BLM) photography (CPIR, RWIR, WWIR, and RKSP series, 1974-1976) was used to provide detail in select areas. The BLM photos were color infrared at a scale of 1:31,680. In localized areas, additional photography from multiple sources and dates was used to fill small gaps in the NHAP coverage. The photography was analyzed by using a Fairchild Aviation Corporation Magnifying Mirror Stereoscope and an Abrams Instrument Corporation Pocket Stereoscope.

GIS Methodology

The surficial geology of the polygons were attributed usin a nin-digit character NAME, representing the surficial geologic unit nomenclature, and a six-digit numeric item CODE, representing the classification of the unit.

Currently the product can be referred to as digital map series 2002-4. Additional errors may exist which will be fixed in future releases. It should be noted that if the product is viewed at a scale much larger than 1:100, 000 the linework will appear jagged. This is an artifact remaining from the vectorization process that exists within the GTX-OSR and ARC/INFO software. No smoothing routines were performed on the linework in order to avoid poetential error propogation.

This product was sub-contracted to the company TGS Technical Graphic Systems, Inc. They executed raster to vector conversions, completed edits, and delivered the product in an ARC/INFO coverage.

Mapping Classification Scheme

The classification scheme for surficial geologic units developed by the Wyoming State Geological Survey was a modification of those developed by Gibbons (1986a, 1986b), Pierce (1973, 1974a, 1974b, 1974c), Reheis (1987), Reheis and Coates (1987), Reheis and Williams (1984), Richmond (1973a, 1973b, 1973c, 1973d, 1974, 1977), Richmond and Pierce (1971, 1972), Richmond and Waldrop (1972, 1975), Waldrop (1975a, 1975b), and Waldrop and Pierce (1975). The classification scheme has two phases, with the first phase being a simple classification and description of single units, such as alluvium (a), colluvium (c), eolian (e), and bedrock (R). The second phase of the classification combines the single elements into a multi-element classification and description for a specific mapping unit. In many cases, a specific mapping unit may be composed of many single elements, such as slopewash (s), colluvium (c), and bedrock (R), that in certain areas can not be shown separately at a scale of 1:100,000. In such cases, the single elements were combined into a more complex unit (scR), with the single elements ranked from most dominant to least dominant. The mapping unit scR would then represent a complex deposit composed of slopewash, colluvium, and bedrock outcrops, with more slopewash present than either colluvium or bedrock outcrop.

State Map Classification Codes

Alluvial Deposits

Alluvium and alluvium mixed with residuum, eolian deposits, lacustrine deposits and/or slopewash (101)
(a, ae, ars, ar, are, asre, ea)

Alluvium mixed with terrace deposits, with (scattered) eolian deposits and/or residuum (102)
(at, ate)

Alluvial Fan Deposits

Alluvial fan deposits and alluvial fan deposits mixed with slopewash, alluvium, residuum, and/or eolian deposits (201)
(af, sf, sfa, sfr)

Bench Deposits

Bench deposits and bench deposits mixed with eolian deposits, residuum, and/or slopewash (401)
(b, be, eb)

Dissected bench deposits and dissected bench deposits mixed with slopewash, eolian deposits, and/or residuum (402)
(bd)

Terrace Deposits

Terrace deposits and terrace deposits mixed with alluvium, eolian deposits, residuum, and/or slopewash (601)
(t, ta, tar, ts)

Dissected terrace deposits and dissected terrace deposits mixed with slopewash, alluvium, eolian deposits, and/or residuum (602)
(td, tde)

Shallow terrace deposits or shallow terrace deposits/structural terrace mixed with residuum and/or eolian deposits (603)
(tr)

Eolian Deposits

Eolian deposits and eolian deposits mixed with residuum, slopewash and alluvium (701)
(e, er, esr, eRp)

Eolian deposits mixed with scattered bedrock outcrops or structural terrace/ terrace deposits and residuum and/or slopewash (703)
(erR)

Landslide Deposits

landslides and landslides mixed with slopewash (801)
(l, ls)

Mesa Deposits

Mesa caprock mixed with a thin cover of residuum and/or eolian deposits (901) (rm)

Playa Lake and Playa Lake Deposits

Playa lake, playa lake deposits, and playa lake deposits mixed with eolian deposits, residuum and/or alluvium (1001)
(ep, p, pa, pe, pre, ap)

Slopewash

Slopewash and slopewash mixed with residuum, alluvium, eolian deposits, alluvial fan deposits, grus and/or colluvium (1101)
(asr, s, sa, sae, sar, scr, sr, sra, srae, srf)

Slopewash mixed with scattered bedrock outcrops and residuum, alluvial fan deposits, alluvium, grus, colluvium, clinker, and/or eolian deposits (1102)
(scR, sraR, srcR, sRe, srR, srRa)

Residuum

Residuum mixed with slopewash, alluvium, eolian deposits, and/or alluvial fan deposits (1401)
(rsa, rs, rae, ras, r, ra, rse)

Residuum mixed with scattered bedrock outcrops or structural terrace/terrace deposits and slopewash, alluvium, eolian deposits, alluvial fan deposits, and/or colluvium (1402)
(rRs, rsaR, rsR, rsRa, rsRe)

Bedrock

Bedrock and bedrock mixed with colluvium, alluvial fan deposits, eolian deposits, slopewash, grus, clinker, and/or residuum (1501)
(Rcs, Rr, Rrs, Rse)

Bedrock or upturned truncated bedrock with a thin mantle of eolian deposits, residuum, and/or slopewash (1502)
(esR, rR, eR)

Lake

Water (1601)
(water)

Mined Areas

Mined Areas (1701)
(m)

Structural Terrace/Terrace Deposits

Structural terrace/terrace deposits with a mantle of eolian deposits, residuum, and/or alluvial deposits (1801)
(rT/t)

Single-Element Classification and Description

a	alluvium - stream and river deposits
b	bench - a strip of relatively level earth or rock, raised and capped with gravel.
c	colluvium - loose and incoherent deposits, usually at the foot of a cliff or on the surface of a slope and there chiefly by gravity.
d	dissected
e	eolian deposits - wind blown deposits, includes sand, silt, and clay
f	alluvial fan deposits - a fan shaped deposit made by a stream or a debris flow where they have run out onto a level plain.
l	landslide - earth and rock which became loosened from a hillside and slides, flows, or falls down the slope.
m	mesa - a bedrock-capped plateau or tableland.
p	playa lake - broad, shallow sheets of water which quickly gather and evaporite, leaving mud flats or broad, shallow deposits.
R	bedrock
r	residuum - a residual deposit remaining in place after the decomposition of rocks.
s	slopewash - soil and rock material that has been moved down a slope by gravity assisted by running water.
t	terrace deposits - relict alluvial deposits on relatively flat, horizontal, or gently inclined surfaces which are bounded by a steeper ascending slope on one side and by a steeper descending slope on the opposite side.
T/t	structural terrace and/or terrace deposits

Multi-Element Classification and Description

The first letter represents the main surficial unit seen on aerial photographs. Following letters represent other deposits that were seen in smaller amounts.

a	alluvial deposits
ae	alluvial deposits mixed with eolian deposits
af	alluvial deposits and alluvial fan deposits
ap	alluvial deposits mixed with playa lake deposits
ar	alluvial deposits mixed with residuum
are	alluvial deposits mixed with residuum and eolian deposits
ars	alluvial deposits mixed with residuum and slopewash deposits

asr	alluvial deposits mixed with slopewash and residuum
asre	alluvial deposits mixed with slopewash, residuum and eolian deposits
at	alluvial deposits mixed with terrace deposits
ate	alluvial deposits mixed with terrace and eolian deposits
b	bench deposits
bd	dissected bench deposits
be	bench deposits mixed with scattered eolian deposits
e	eolian deposits
ea	eolian deposits mixed with alluvial deposits
eb	eolian deposits covering dissected bench deposits
ep	eolian deposits mixed with playa lake deposits
er	eolian deposits mixed with residuum
esr	eolian deposits mixed with slopewash and residuum
eR	eolian deposits mixed with bedrock outcrops
eRp	eolian deposits mixed with bedrock outcrops and playa lake deposits
erR	eolian deposits mixed with residuum and bedrock
esR	eolian deposits mixed with slopewash and bedrock outcrops
l	landslide debris
ls	landslide debris mixed with slopewash
m	mesa caprock
p	playa lake and playa lake deposits
pa	playa lake and playa lake deposits mixed with alluvial deposits
pe	playa lake and eolian deposits, often occurring in a deflation hollow
pre	playa lake deposits mixed with residuum and eolian deposits
Rcs	bedrock covered in places by colluvium and slopewash
Rr	bedrock covered in places by residuum
Rrs	bedrock covered in places by slopewash, and residuum
Rse	bedrock covered in places by slopewash and eolian deposits
r	residuum
ra	residuum mixed with alluvial deposits
rae	residuum mixed with alluvial and eolian deposits
as	residuum mixed with alluvial deposits and slopewash
rm	mesa caprock with a thin cover of residuum
rR	residuum mixed with bedrock outcrops
rRs	residuum mixed with bedrock outcrops and slopewash
rs	residuum mixed with slopewash
rsa	residuum mixed with slopewash and alluvial deposits
rsaR	residuum mixed with slopewash, alluvial deposits, and bedrock outcrops
rse	residuum mixed with slopewash and scattered eolian deposits
rsR	residuum mixed with slopewash and bedrock outcrops
rsRa	residuum mixed with slopewash, bedrock outcrops and alluvium
rsRe	residuum mixed with slopewash, bedrock outcrops, and eolian deposits
rT/t	residuum on a structural terrace and/or terrace deposits
s	slopewash
sa	slopewash mixed with alluvial deposits
sae	slopewash mixed with alluvial and eolian deposits

sar	slopewash mixed with alluvial deposits and residuum
scr	slopewash mixed with colluvium and residuum
scR	slopewash mixed with colluvium and bedrock outcrops
sf	slopewash mixed with alluvial fan deposits
sfa	slopewash mixed with alluvial fan deposits that grade into alluvial deposits
sfr	slopewash mixed with alluvial fan deposits and residuum
sr	slopewash mixed with residuum
sRe	slopewash mixed with bedrock outcrops and eolian deposits
sra	slopewash mixed with residuum and alluvial deposits
srae	slopewash mixed with residuum, alluvial deposits, and eolian deposits
sraR	slopewash mixed with residuum, alluvial deposits, and bedrock outcrops
srcR	slopewash mixed with residuum, colluvium, and bedrock outcrops
srf	slopewash mixed with residuum and alluvial fan deposits
srR	slopewash mixed with residuum and bedrock outcrops
srRa	slopewash mixed with residuum, bedrock outcrops, and alluvium
t	terrace deposits
ta	terrace deposits mixed with alluvial deposits
tar	shallow terrace deposits mixed with alluvial deposits and residuum
td	dissected terrace deposits
tde	dissected terrace deposits mixed with scattered eolian deposits
tr	terrace deposits mixed with residuum
ts	terrace deposits mixed with slopewash