



Geology - Interpreting the past to provide for the future



Prepared in cooperation with the
U.S. GEOLOGICAL SURVEY



OPEN FILE REPORT 04 - 3
Nowater Creek 1:100,000 - scale Surficial Geologic Map

CLASSIFICATION OF MAP UNITS

Alluvial Deposits

Alluvium

Alluvium and alluvium mixed with residuum, colluvial deposits, lacustrine deposits and/or slopewash (101)

Alluvium mixed with terrace deposits, with (scattered) colluvial deposits and/or residuum (102)

Alluvial Fan Deposits

Alluvial fan deposits and alluvial fan deposits mixed with slopewash, alluvium, residuum, and/or colluvial deposits (201)

Alluvial fan deposits grading into bench deposits or terrace deposits, or alluvial plain deposits mixed with slopewash, residuum and/or colluvial deposits (202)

Dissected alluvial fan deposits and dissected alluvial fan deposits that grade into terrace deposits, mixed with slopewash and/or residuum (204)

Bench Deposits

Bench deposits and bench deposits mixed with colluvial deposits, residuum, and/or slopewash (401)

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

Terrace Deposits

Terrace deposits and terrace deposits mixed with alluvium, colluvial deposits, residuum, and/or slopewash (601)

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

Landslide Deposits

Landslides and landslides mixed with slopewash (801)

Mesa

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

Playa Lake and Playa Lake Deposits

Playa lake, playa lake deposits, and playa lake deposits mixed with colluvial deposits, residuum and/or alluvium (1001)

Slopewash

Slopewash and slopewash mixed with residuum, alluvium, colluvial deposits, alluvial fan deposits, and/or colluvium (1101)

Slopewash mixed with scattered bedrock outcrops and residuum, alluvial fan deposits, alluvium, and/or colluvium, and/or colluvial deposits (1102)

Residuum

Residuum mixed with slopewash, alluvium, colluvial deposits, and/or alluvial fan deposits (1401)

Residuum mixed with scattered bedrock outcrops or structural terrace/terrace deposits and slopewash, alluvium, colluvial deposits, alluvial fan deposits, and/or colluvium (1402)

Bedrock

Bedrock and bedrock mixed with colluvium, alluvial fan deposits, colluvial deposits, slopewash, and/or residuum (1501)

Bedrock, or upturned truncated bedrock with a thin mantle of colluvial deposits, residuum, and/or slopewash (1502)

	112°W	111°W	110°W	109°W	108°W	107°W	106°W	105°W	104°W
45°N	Hobbs Lake	Yellowstone National Park	HSDM 00-3	Yellowstone National Park	HSDM 99-3	HSDM 01-2	HSDM 99-5	USGS C-11F	HSDM 01-3
			Cedar	Forest	Forest	Shoshone	Shoshone	Shoshone	Devils Tower
44°N	Astoria	Yellowstone National Park	Canter Mountain	Canter Mountain	HSDM 00-6	HSDM 00-2	HSDM 00-2	USGS C-105	HSDM 01-6
			Black	Black	Black	Black	Black	Black	Black
43°N	Reisburg	Jackson Lake	The Ramoth	Thompson	Thompson	Thompson	Thompson	Thompson	Thompson
			Thompson	Thompson	Thompson	Thompson	Thompson	Thompson	Thompson
42°N	Pallidates	Jackson	Garfield Peak	Riverfront	Lytle	Lytle	Lytle	Lytle	Lytle
			Garfield Peak	Riverfront	Lytle	Lytle	Lytle	Lytle	Lytle
41°N	Soda Springs	Wyon	Providence	Lander	Rattlesnake Hills	HSDM 99-3	HSDM 99-2	HSDM 99-2	HSDM 99-2
			Providence	Lander	Rattlesnake Hills	Shoshone	Shoshone	Shoshone	Shoshone
40°N	Prison	Fortenberry	Farnon	South Pass	Daniel	Shirley Basin	Laramie Park	HSDM 99-6	HSDM 99-6
			Farnon	South Pass	Daniel	Shirley Basin	Laramie Park	Laramie Park	Laramie Park
39°N	Logan	USGS C-102	HSDM 99-4	Red Desert	HSDM 99-6	Medicine Bow	SMP 04-2	OFR 04-4	OFR 04-4
		Reynolds	Black Springs	Black Springs	Black Springs	Black Springs	Black Springs	Black Springs	Black Springs
38°N	Ogden	USGS C-103	Extruded	Extruded	Extruded	Extruded	Extruded	Extruded	Extruded
			Extruded	Extruded	Extruded	Extruded	Extruded	Extruded	Extruded

Current map Published maps Maps in progress
Proposed maps Compiled maps

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

KEY TO ABBREVIATIONS
U.S. Geological Survey maps: Coal Investigations Series (C), Wyoming State Geological Survey maps: Open File Report (OFR), Hazards Section Digital Map (HSDM), and unpublished STATEMAP project (SMP).

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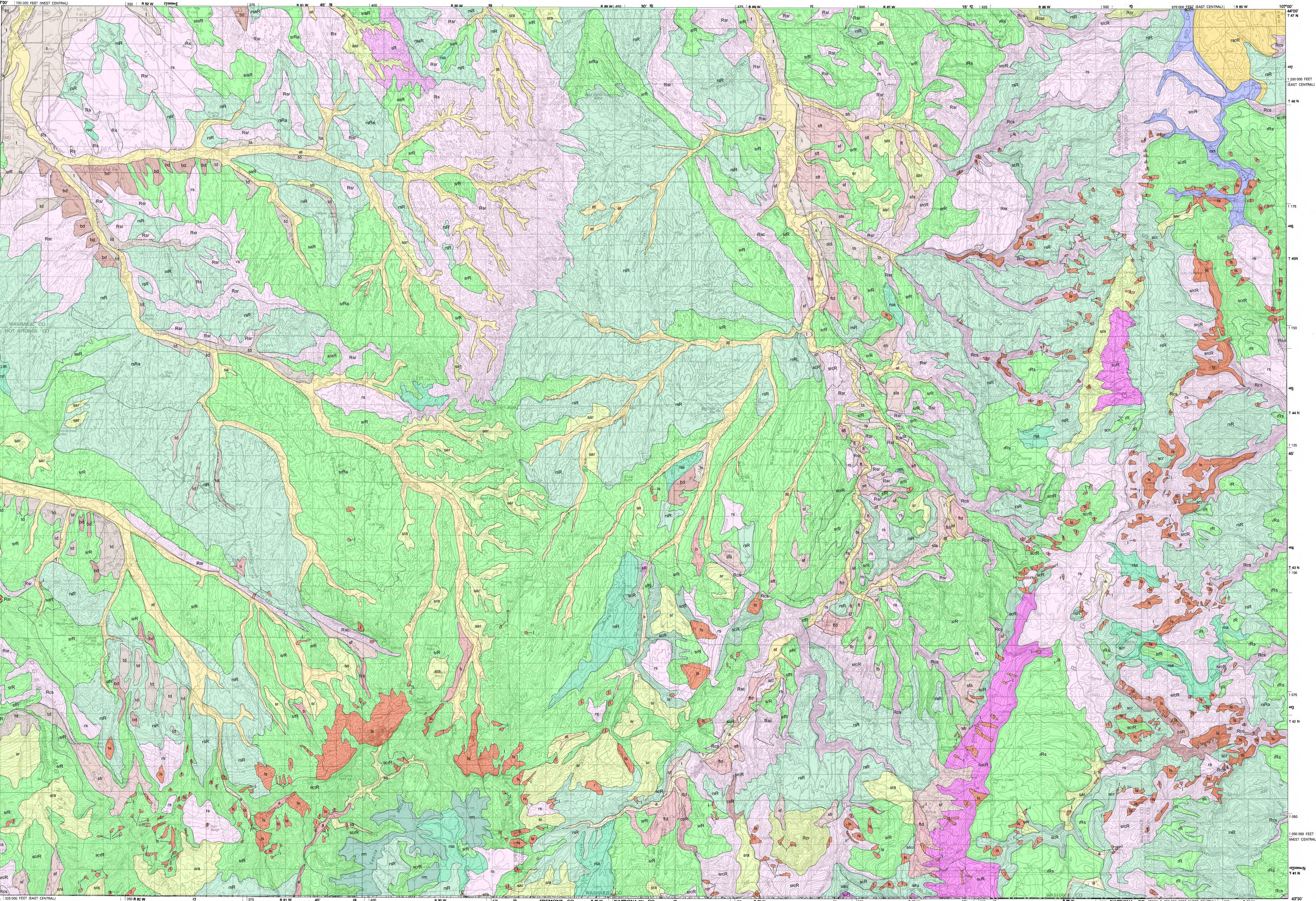
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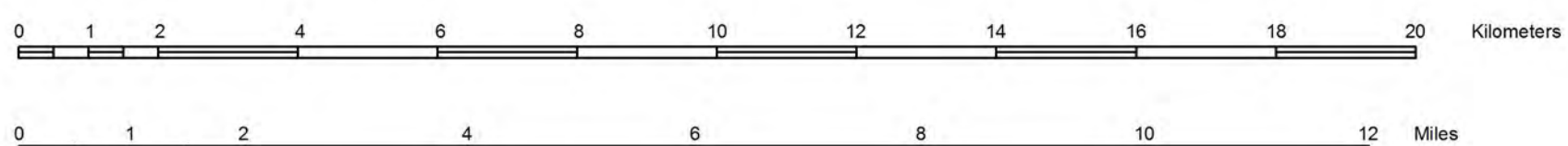
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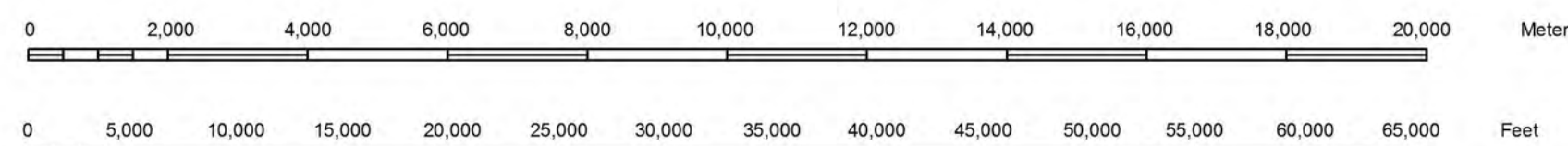


Projection: Universal Transverse Mercator (UTM), zone 13
North American Datum of 1927 (NAD 27)
10,000-meter grid ticks: UTM, zone 13
50,000-foot grid ticks: Wyoming State Plane Coordinate System, East zone



SCALE 1:100,000

Contour interval 20 meters



Prepared in cooperation with the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under Cooperative Agreement Number 03HQAG0097.

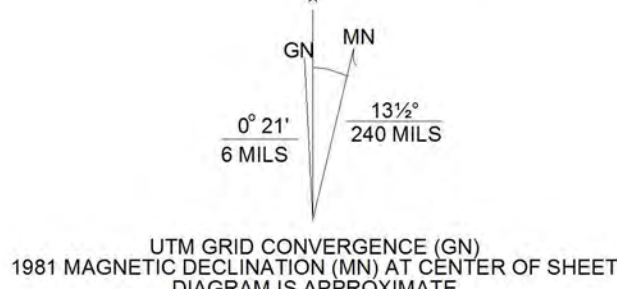
Digital cartography by Robin Lyons and Joseph M. Huss.

PRELIMINARY SURFICIAL GEOLOGIC MAP OF THE NOWATER CREEK 30' x 60' QUADRANGLE, WASHAKIE, HOT SPRINGS, AND JOHNSON COUNTIES, WYOMING

Compiled and mapped by

Laura L. Hallberg and James C. Case

2002



OPEN FILE REPORT 04-3

**PRELIMINARY DIGITAL
SURFICIAL GEOLOGIC MAP
OF THE
NOWATER CREEK 30' X 60' QUADRANGLE,
HOT SPRINGS, JOHNSON AND
WASHAKIE COUNTIES, WYOMING**

*Mapped and compiled by Laura L. Hallberg and James C. Case
Digital cartography by Robin W. Lyons, and Joseph M. Huss*

WYOMING STATE GEOLOGICAL SURVEY

Lance Cook, State Geologist

*Laramie, Wyoming
2004*

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 03HQAG0097.*

**Preliminary Digital Surficial Geologic Map of the Nowater Creek 30' x 60'
Quadrangle,
Hot Springs, Johnson and Washakie, Wyoming**

Background

The Preliminary Surficial Geologic Map of the Nowater Creek 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 Surficial Geologic Map of the Nowater Creek 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.

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 using a nine-digit character S_Unit, representing the surficial geologic unit nomenclature, and a six-digit numeric item S_Code, representing the classification of the unit.

Currently the product can be referred to as Open File Report (OFR) 04-3. Errors may exist as the product is preliminary surficial geology mapping. Any errors will be corrected with future releases. The product was produced at 1:100,000 scale and should not be utilized at scales larger than produced.

The vector polygon product was produced via on-screen digitizing of the original scanned surficial surficial geologic map. The map was scanned at 300dpi on a Hewlett Packard 800ps scanner. The image was georeferenced in ArcGIS 9.0 to the 1:100,000 quad base and statewide tic layer. The data was initially digitized as an ESRI personal Geodatabase in ArcGIS 9.0. The topology was checked for overlaps and gaps and fixed accordingly. The product was then exported to ESRI shapefiles for use by other GIS and CAD systems. The annotation was created within the map document from the surficial geology attributes and does not exist as a separate annotation layer.

The raster base map was scanned at 300dpi on a Hewlett Packard 800ps scanner and converted to black and white by Adobe Photoshop. The image was georeferenced in ArcGIS 9.0 to the 1:100,000 quad base and statewide tic layer.

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

Alluvium and alluvium mixed with residuum, eolian deposits, grus, lacustrine deposits and/or slopewash (101)
(a, ae, aer, aes, ar, are, ars, arse, arw, asre, aw, awr, ea, ear, eas, raw)

Alluvium mixed with terrace deposits, with scattered eolian deposits, slopewash, and/or residuum (102)
(ast, at, ate, ater, atr, ats, atsr, eat, sat)

Shallow alluvium mixed with scattered bedrock outcrops and residuum, slopewash, and/or colluvium (103)
(aR, aRe, arR, ascR, aseR, asR, asRe)

Alluvial Fan Deposits

Alluvial fan deposits and alluvial fan deposits mixed with slopewash, alluvium, residuum, and/or eolian deposits (201)
(af, afe, afr, afs, asf, f, fa, far, fas, fe, frsa, fs, fsa, fse, fsr, sf, sfa, sfae, sfar, sfe, sfr, sfre)

Alluvial fan deposits grading into bench deposits or terrace deposits, or alluvial plain deposits mixed with slopewash, residuum, and/or eolian deposits (202)
(fAs, fb, fbe, fbr, fbs, ft, fte, ftr, fts, sfb, sft, sfr)

Alluvial fan deposits grading into dissected bench deposits, mixed with slopewash, residuum, and/or eolian deposits (203)
(fbd, fbdr, fbds, sfbdr)

Dissected alluvial fan deposits and dissected alluvial fan deposits that grade into terrace deposits, mixed with slopewash and/or residuum (204)
(fd, fdr, fdrs, fds, fdsr, ftd, ftde, ftdr, ftds, rftd, sftd, sfd, sfdR)

Old Alluvial Plain Deposits

Dissected old alluvial plain deposits and dissected old alluvial plain deposits mixed with eolian deposits (301)
(Ad, Ade)

Bench Deposits

Bench 401 – Bench deposits and bench deposits mixed with eolian deposits, residuum, and/or slopewash (401)
(b, be, br, bre, bs, eb, rb)

Bench 402 – Dissected bench deposits and dissected bench deposits mixed

with slopewash, eolian deposits, and/or residuum (402)
(bd, bde, bdr, bdre, bdrs, bds, ebd, ebdr, sbd, sbde)

Bench Deposits or mesa caprock undifferentiated

Bench deposits / mesa caprock and bench deposits/mesa caprock with a thin cover of eolian deposits and/or residuum (501)
(b/m, b/me, eb/m, erb/m, rab/m, rb/m, rb/ma, rb/me)

Bench-Mesa 502 – Dissected bench deposits / mesa caprock and dissected bench deposits/ mesa caprock with a thin cover of eolian deposits, slopewash, and/or residuum (502)
(b/md, b/mde, eb/md, rb/md, rb/mde, sb/md)

Terrace Deposits

Terrace deposits and terrace deposits mixed with alluvium, eolian deposits, residuum, and/or slopewash (601)
(et, st, str, t, ta, tae, tar, tare, tas, te, ter, tra, ts, tse, tsr)

Dissected terrace deposits and dissected terrace deposits mixed with slopewash, alluvium, eolian deposits, and/or residuum (602)
(etd, etdr, std, stde, stdr, td, tda, tdar, tde, tdr, tdre, tdrs, tds)

Shallow terrace deposits or shallow terrace deposits / structural terrace mixed with residuum, alluvium, and/or eolian deposits (603)
(ert, ert/T, etr, rat, ret/T, rt, rte, rt/Te, rt/Ts, tr, tre, t/Tr)

Dissected shallow terrace deposits and dissected shallow terrace deposits / structural terrace mixed with residuum and/or eolian deposits (604)
(ertd, ret/Td, rtd, rtde, rt/Td, rt/Tde)

Dissected shallow terrace deposits mixed with scattered bedrock outcrops and slopewash (606)
(stdR)

Terrace deposits/ structural terrace and terrace deposits/structural terrace mixed with eolian deposits (607)
(t/T, t/Te)

Terrace 608 - Dissected terrace deposits/ structural terrace and dissected terrace deposits/structural terrace mixed with slopewash, alluvium, residuum, and eolian deposits (608)
(sat/T, st/Td, t/Td, t/Tde, t/Tdr, t/Tdra, t/Tdre)

Eolian Deposits

Eolian deposits and eolian deposits mixed with residuum, slopewash, and alluvium (701)

(e, er, era, ers, ersa, es, esr, esra)

Eolian deposits covering terrace deposits or terrace deposits / structural terrace (702)

(et/T)

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

(eRp, erR, ersR, erT, erT/t, erT/ta)

Eolian deposits covering dissected terrace deposits or dissected terrace deposits / structural terrace (704)

(ertd, et/Td)

Eolian deposits mixed with dissected structural terrace / terrace deposits and residuum (705)

(erTd, erT/td)

Landslide Deposits

Landslides and landslides mixed with slopewash, colluvium, alluvium, and/or scattered bedrock outcrops (801)

(l, laR, lc, ls, srl)

Mesa

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

(erm, rm, rme, rms)

Dissected mesa caprock with a thin cover of residuum and/or eolian deposits (902)

(mdr, rmd, rmde, rmdsa, srmd)

Playa lake and playa lake deposits

Playa lake, playa lake deposits, and playa lake deposits mixed with eolian deposits, residuum and/or alluvium (1001)

(aep, ap, eap, ep, epa, epr, p, pa, pe, pre)

Slopewash

Slopewash and slopewash mixed with residuum, alluvium, eolian deposits, alluvial fan deposits, grus and/or colluvium (1101)

(as, ase, asr, asu, esa, s, sa, sae, saf, sar, sare, sau, sc, scr, sea, ser, sera, sr, sra, srae, src, sre, srf, srfe, sur, sura)

Slopewash mixed with scattered bedrock outcrops and residuum, alluvial fan deposits, alluvium, grus, colluvium, clinker, and/or eolian deposits (1102)
(sacR, saR, saRe, sarR, sauR, scR, scRa, scRe, scRr, scrR, scuR, sfdR, sfR, sfRe, sfrR, sraR, srcR, sRe, sreR, srfR, sRk, sRr, srR, srRa, srRc, srRe, srRf, srRk, sruR, sucR, suR, surR)

Colluvium

Colluvium mixed with slopewash, alluvial fan deposits, and/or residuum (1201)
(c, cs, csa, csf, csr)

Colluvium mixed with scattered bedrock outcrops and residuum, grus and/or slopewash (1202)
csR, csrR, csuR, cuR, rcs, rcsR

Glacial Deposits and Features

Glacial Outwash

Glacial outwash, and glacial outwash mixed with alluvium, terrace deposits, and glacial deposits (1301)
(ag, ao, go, o, to)

Glacial deposits

Glacial deposits and glacial deposits mixed with colluvium, slopewash, alluvium, grus, and landslide deposits (1302)
(ag, csg, g, ga, gs, gsa, lg, rsg, sag, sg, srg, uga)

Glacial deposits mixed with scattered bedrock outcrops and alluvium, colluvium, grus, residuum, and/or slopewash (1303)
(csgR, gsR, rsgR, rsRg, sagR, scgR, sgR, suRg, usgR)

Glaciated bedrock

Glaciated bedrock with a mantle of glacial deposits and alluvium, colluvium, residuum, slopewash, and/or grus (1304)
(csgG, , Gcg, Gcsg, gG, Grg, gsaG, gcsG, gsG, Gg, Gsg, Gucg, Gusg, rgG, rsgG, sagG, sgG, usgG)

Residuum

Residuum mixed with slopewash, alluvium, eolian deposits, and/or alluvial fan deposits (1401)
(r, ra, rae, raes, ras, rase, re, rea, reas, res, rs, rsa, rsae, rse, rsf)

Residuum mixed with scattered bedrock outcrops or structural terrace / terrace deposits and slopewash, alluvium, eolian deposits, alluvial fan deposits, and/or colluvium (1402)
(raR, raRe, rasR, reR, resR, reT/t, reT/tR, rRa, rRae, rRcs, rRe, rRs, rRsa, rRsc, rRse, rsaR, rscR, rseR, rsfR, rsR, rsRa, rsRe, rsT, rsT/t, sRs)

Residuum mixed with slopewash, eolian deposits, and/or alluvium on dissected bedrock outcrops and/or a dissected structural terrace/terrace (1403)
(raT/td, raT/tde, reRd, resTd, reTd, reT/td, rsaRd, rsaT/td, rsRd, rsRda, rsT/td)

Grus mixed with scattered bedrock outcrops and slopewash, alluvium, and/or residuum (1404)
(rusR, uaR, ursR, usR, usaR, usrR)

Bedrock

Bedrock and bedrock mixed with colluvium, alluvial fan deposits, eolian deposits, glacial debris, slopewash, grus, clinker, alluvium, and/or residuum (1501)
(R, Rc, Rcr, Rcs, Rcsa, RcsG, Rcsr, Rcsu, Rcu, Re, Rr, Rrc, Rrce, Rrcs, Rres, Rrs, Rrsa, Rrsc, Rrse, Rrsk, Rs, Rsa, Rsc, Rscr, Rse, Rsf, Rsk, Rsr, Rsra, Rsre, Rsrk, Rsu, Ru, Ruc, Rucs, Rus, Rusc, Rusr)

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

Upturned and truncated bedrock with a thin mantle of residuum, terrace deposits, alluvium, bench deposits, and/or eolian deposits (1503)
(bx, rx, rxae, rxe, trx, tx)

Dissected bedrock with a thin mantle of residuum, colluvium, slopewash, alluvium, and/or eolian deposits (1504)
(Rdrc, rRde, rRda, rRds, srRda)

Lake

Lake (1601)

Mined Areas

Mined Areas (1701)
(M, RrM, RrsM)

Structural terrace/terrace deposits

Structural terrace/terrace deposits with a mantle of eolian deposits, residuum, slopewash, and/or alluvial deposits (1801)
(raT/t, raT/te, reT, reT/tr, rT, rTe, rTs, rT/t, rT/ta, rT/te, rT/tR, rT/ts, sT, Tr, T/t, T/tr)

Structural terrace/terrace deposits 1802 – Dissected structural terrace/terrace deposits with a mantle of residuum, slopewash, and/or eolian deposits (1802)
(rTd, rTde, rTdeR, rTds, rT/td, rT/tda, rT/tde, saT/td, Tdr, T/tde, T/tdra)

Volcanic neck

Volcanic neck (1901)

(v)

Clinker

Clinker mixed with residuum, slopewash, and/or alluvial deposits (2001)
(kr, kra, krs, rak, rsak, rsk, srak, srk)

Clinker mixed with scattered bedrock outcrops and slopewash and/or Residuum
(2002)
(rRsk, rskR, rsRk)

Periglacial Features and Deposits

Periglacial features and deposits mixed with colluvium (2101)
(csq, rsq)

Periglacial features and deposits mixed bedrock outcrops and grus, colluvium,
and/or slopewash (2102)
(csRq, rsRq, Rucq, usRq)

Karst

Karst mixed with alluvium, residuum, and/or residuum mixed with slopewash
(2201)
(arK, Krs)

NOTE: rtd and rtde were originally classified as 603. They are now 604.
erT/ta moved from 1801 to 703
reTd moved from 1802 to 1403

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
kr	clinker deposits mixed with residuum
kra	clinker residuum mixed with alluvial deposits
krs	clinker covered in places by slopewash, and residuum
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
rak	residuum mixed with alluvial deposits and clinker
ras	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
rsak	residuum mixed with slopewash, alluvial deposits and clinker
rsk	residuum mixed with slopewash and clinker
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
srak	slopewash mixed with residuum, alluvial deposits, and clinker
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
srk	slopewash mixed with residuum and clinker
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