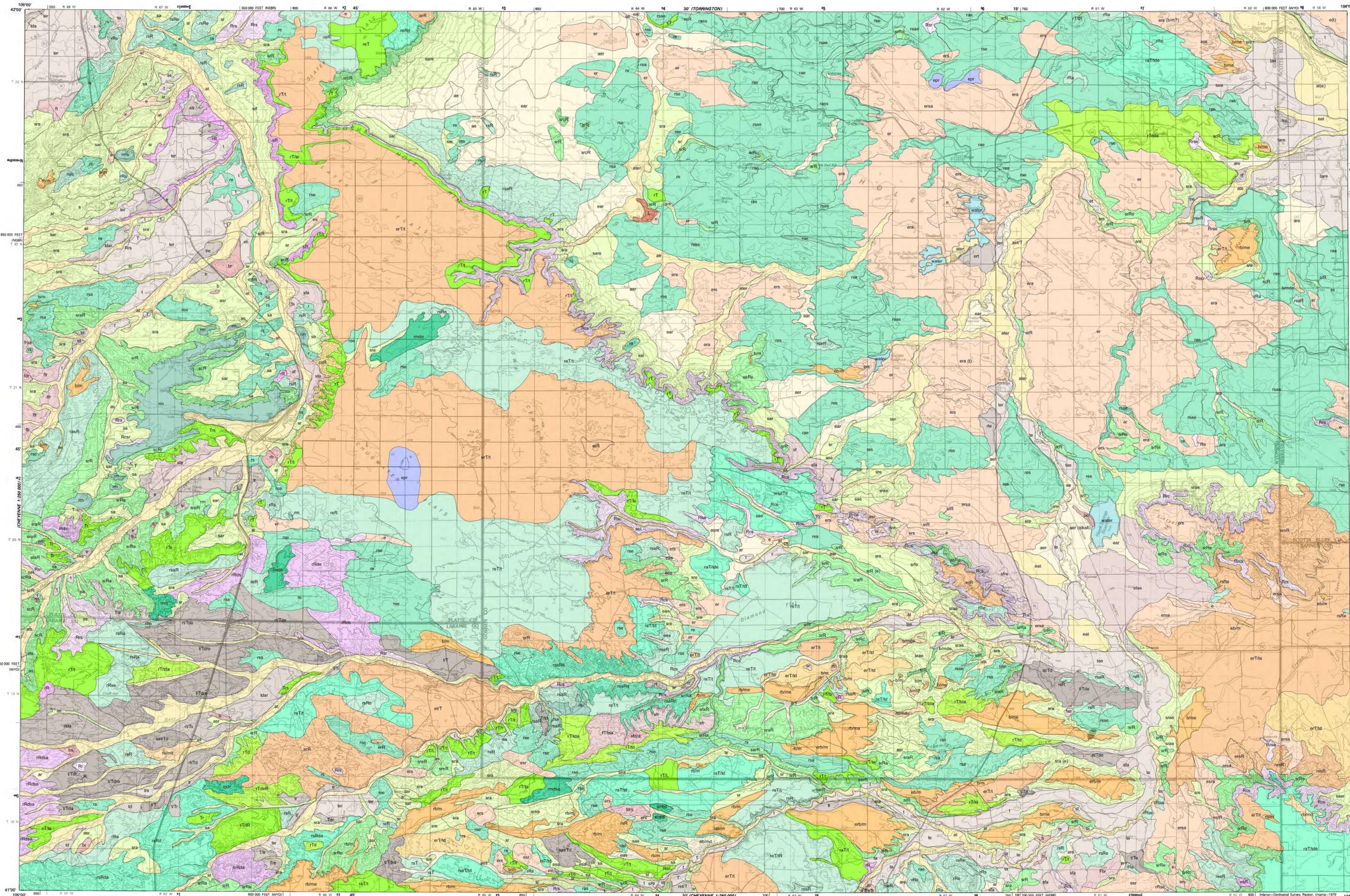




Geology - Interpreting the past to provide for the future



Prepared in cooperation with  
the U.S. GEOLOGICAL SURVEY



CLASSIFICATION OF MAP UNITS

- Alluvial Deposits**
  - Alluvium and alluvium mixed with residuum, colluvial deposits, lacustrine deposits and/or slopewash (101) (ae, aer, as, ear, eas, ac, ar, abnd, ar, are)
  - Alluvium mixed with terrace deposits or terrace deposits/structural terrace, with (scattered) colluvial deposits and/or residuum (102) (at, ae/T, aer, as, ear, ac, ar, sar)
- Alluvial Fan Deposits**
  - Alluvial fan deposits and alluvial fan deposits mixed with slopewash, alluvium, residuum, and/or colluvial deposits (201) (sfr, st, sf, fa, fs, fac, sfr, fsra)
  - Alluvial fan deposits grading into bench deposits or terrace deposits, or structural terrace/terrace deposits, or alluvial plain deposits mixed with slopewash, residuum and/or colluvial deposits (202) (Fbr, ft, fr, FT/ta)
  - Dissected alluvial fan deposits and dissected alluvial fan deposits that grade into terrace deposits, mixed with slopewash and/or residuum (204) (fd, fds)
- Bench Deposits**
  - Bench deposits and bench deposits mixed with colluvial deposits, residuum, and/or slopewash (401) (rb, be, b, br, bs)
- Bench Deposits or mesa caprock undifferentiated**
  - Bench deposits, mesa caprock and bench deposits, mesa caprock with a thin cover of colluvial deposits and/or residuum (501) (b/mc, eb/m, rb/m, r/bma, rb/mc, b/m, rb/m, erb/m)
  - Dissected bench deposits, mesa caprock and dissected bench deposits, mesa caprock with a thin cover of colluvial deposits, slopewash and/or residuum (502) (b/mde, rb/md, b/md, b/mde)
- Terrace Deposits**
  - Terrace deposits and terrace deposits mixed with alluvium, colluvial deposits, residuum, and/or slopewash (601) (t, tae, ta, et, te, tr, ta, ts, ts, te, st, T)
  - Dissected terrace deposits and dissected terrace deposits mixed with slopewash, alluvium, colluvial deposits, and/or residuum (602) (td, tda, tda)
  - Shallow terrace deposits or shallow terrace deposits/structural terrace mixed with residuum and/or colluvial deposits (603) (tre, re, et, v/T, tr, ret/T, rt, r/Ts, et, sa/T)
  - Dissected shallow terrace deposits and dissected shallow terrace deposits, structural terrace mixed with residuum and/or colluvial deposits (604) (rt/Tde, rt/Tda, rda)
  - Terrace deposits, structural terrace and terrace deposits, structural terrace mixed colluvial deposits (607) (v/Ts, v/T)
  - Dissected terrace deposits, structural terrace and dissected terrace deposits, structural terrace mixed colluvial deposits (608) (sa/Td, st/Td, v/Tde, v/Tdr, v/Tdre)
- Colluvial Deposits**
  - Colluvial deposits and colluvial deposits mixed with residuum, slopewash and alluvium (701) (e, era, ers, er, esa)
  - Colluvial deposits covering terrace deposits or terrace deposits/structural terrace (702) (et/T)
  - Colluvial deposits mixed with scattered bedrock outcrops or structural terrace/terrace deposits and residuum and/or slopewash (703) (er/Ta, er, ersR)
  - Colluvial deposits mixed with dissected structural terrace/terrace deposits and residuum (705) (er/Tid)
- Landslide Deposits**
  - Landslides and landslides mixed with slopewash (801) (L)
- Mesa**
  - Mesa caprock mixed with a thin cover of residuum and/or colluvial deposits (901) (rm, rms)
  - Dissected mesa caprock with a thin cover of residuum and/or colluvial deposits (902) (mfr, mde, mdsu, srmd)
- Playa lake and playa lake deposits**
  - Playa Lake 1001 - Playa lake, playa lake deposits, and playa lake deposits mixed with colluvial deposits, residuum and/or alluvium (1001) (ep)
- Slopewash**
  - Slopewash and slopewash mixed with residuum, alluvium, colluvial deposits, alluvial fan deposits, gms and/or colluvium (1101) (sca, ser, ar, ear, asr, sac, sra, sra, sac, sar, sa, sca, sr)
  - Slopewash mixed with scattered bedrock outcrops and residuum, alluvial fan deposits, alluvium, gms, colluvium, clinker, and/or colluvial deposits (1102) (scR, scRe, scRr, srR, srRe, srRa, srRa, srRr, srRr, srRr)
- Colluvium**
  - Colluvium mixed with slopewash, alluvial fan deposits, and/or residuum (1201) (cs)
  - Colluvium mixed with scattered bedrock outcrops and gms and/or slopewash (1202) (csR)
- Residuum**
  - Residuum mixed with slopewash, alluvium, colluvial deposits, and/or alluvial fan deposits (1401) (rca, rca, rse, re, reas, rae, re, r, rs, rsc, rca, rca, ra)
  - Residuum mixed with scattered bedrock outcrops or structural terrace/terrace deposits and slopewash, alluvium, colluvial deposits, alluvial fan deposits, and/or colluvium (1402) (rRe, rReR, rRa, rRa, rRe, rReR, rRe, rRe, rRe, rRe, rRe, rRe, rRe)
  - Residuum mixed with slopewash, colluvial deposits, and/or alluvium on dissected bedrock outcrops and/or dissected structural terrace/terrace (1403) (rT/d, rT/d, rT/d)
- Bedrock**
  - Bedrock and bedrock mixed with colluvium, alluvial fan deposits, colluvial deposits, slopewash, and/or residuum (1501) (Rse, Rse, Rse)
  - Bedrock or upturned truncated bedrock with a thin mantle of colluvial deposits, residuum, and/or slopewash (1502) (sR, esR, rR)
  - Dissected bedrock with a thin mantle of residuum and/or colluvial deposits (1504) (rRda, rRda, rRda, rRda, rRda, rRda)
- Structural Terrace/Terrace Deposits**
  - Structural terrace/terrace deposits with a mantle of colluvial deposits, residuum, and/or alluvial deposits (1601) (rT/d, rT/d, rT/d)
  - Dissected structural terrace/terrace deposits with a mantle of residuum, slopewash and/or colluvial deposits (1602) (rT/dR, rT/dR, rT/dR)
- Water Features**
  - Lake, stream, river (1601) (Water)

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

112°W	111°W	110°W	109°W	108°W	107°W	106°W	105°W	104°W
44°N	43°N	42°N	41°N	40°N	39°N	38°N	37°N	36°N
Yellowstone National Park								
Alton	Jackson Lake							
Palisades								
Slide Springs								
Phelan								
Logan								
Open								

Legend: Current map (Yellow), Published maps (Orange), Maps in progress (Light Orange), Proposed maps (Light Yellow), Compiled maps (Light Green)

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

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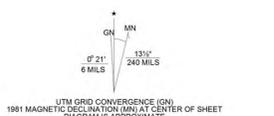
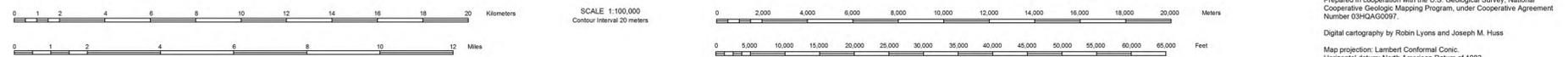
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A digital version of this map is also available on CD-ROM.

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



PRELIMINARY SURFICIAL GEOLOGIC MAP OF THE CHUGWATER 30' x 60' QUADRANGLE, WYOMING

Compiled and mapped by  
James C. Case and Laura L. Hallberg

2004

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  
Map projection: Lambert Conformal Conic.  
Horizontal datum: North American Datum of 1983.  
Ellipsoid: Geoidetic Reference System 80.



OPEN FILE REPORT 04-4

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**PRELIMINARY DIGITAL  
SURFICIAL GEOLOGIC MAP  
OF THE  
CHUGWATER 30' X 60' QUADRANGLE,  
GOSHEN, LARAMIE AND PLATTE  
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.*

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# **Preliminary Digital Surficial Geologic Map of the Chugwater 30' x 60' Quadrangle, Goshen, Laramie and Platte counties, Wyoming**

## **Background**

The Preliminary Surficial Geologic Map of the Chugwater 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 Chugwater 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) 04-4. 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 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, sfbd)

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