

Project Report: Arches Devil's Garden Trails  
Field Review, Analysis, Conclusions, and Recommendations  
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## **Objectives**

This report is part of RM-CESU Cooperative Agreement Number: H1200040001 (IMR) titled "Technical Support for Trail Restoration and Maintenance for Arches and Canyonlands national Parks". It is designed to be a pilot project to support a larger effort to increase road and trail sustainability in these National Parks, responding to growing visitor use, increasing resource damage, and climate change.

This document addresses, in part all three objectives as listed in the agreement. The first objective is "to provide a synthesis of current trail maintenance methods and a perspective on the sustainability program". Current stabilization methods were reviewed below. It also addresses objective Two in the agreement "to provide alternative development analysis and support" for three project areas as designated by NPS staff. This report focuses on the Arches National Park Devil's Garden trail system, emphasizing the Primitive Loop. It also contributes to objective Three which includes "inventory and prioritize potential trouble areas", using the base data to correlate to existing resource inventories, in particular the existing Grant County soil survey and other available spatial data.

## **Methods**

This set of trail interpretations is based on synthesis of data from a field review (Appendix One), the Grant County Soil Survey, draft vegetation spatial data from the National Park Service Inventory and Monitoring program, other digital geographical data provided by Arches National Park and the State of Utah, and interviews with Arches National Park staff.

## **Analysis**

### Landscape Description

The Grant County soil survey shows the entire Loop as composed of eolian deposits derived from sandstone. Surface texture is rated as fine sands and loamy fine sands. Based on the field review, on the average, soils on trails are composed of 60% fine sand; 10% sandy colluvium; 25% bedrock; 5% weakly-cemented sandstone rock layers (distributed as noted in field review notes). Off-trail soil biologic crust is wide-spread, with an average of 50% of surface cover.



Relatively undisturbed soil surface showing biologic soil crust and sandy texture.

Figure 1 shows the landscapes of the trail area. Slopes are generally moderate to gentle. The orientation of bedrock “ribs” and viewing related features (such as arches) are the basis for trail location, and those features actually make up part of the trail tread in places. Vegetation is shrubland, woodland, and complexes of rock outcrop and woodland. Ground cover is primarily biological soil crust (about 50% of the soil surface).



Figure 1. Devil's Garden trail system looking to the north.

## Trail Inventory

Trail segments were defined in the field on the basis of relatively similar landscapes and trail characteristics. Conditions on those segments were interpreted from field review data (Appendix One). Trail segments were rated for current condition and stabilization needs using the definitions in Table 1.

Table 1. Trail Condition Rating Description

Trail Condition Rating	Description
Good:	Trail tread elevation and surface is stable, less than 1' downcut, banks are stable (revegetated); no apparent widening
Moderate:	Trail tread is over 50% stable, 1-2' downcut, some widening; steep areas have eroded up to 4'. Resource damage is isolated.
Poor:	Trail is entirely unstable, more than 2' downcut; banks are unstable (un-vegetated); active widening; unstable sand trail tread is difficult to traverse.

### Description of Trail Conditions

Trails that are in "Good" condition require little maintenance. They are relatively stable (either on bedrock, mechanically stabilized, or in relatively-stable colluvium).



A trail rated in "Good" condition.

Those rated "Good" would still benefit from maintenance and signing to reduce creation of social trails. However, some impacts are still apparent (removal of lichen beds).



Bedrock trail showing lichen removal.

Trails in “Poor” condition are unstable, and are actively damaging resources, both on-site (soils, vegetation), and off-site (sediment, trail widening). They should be stabilized along their entire length, given additional maintenance, or closed.



Trail in “Poor” Condition

Natural revegetation is unlikely to occur on steep, eroding cutslopes. This is probably because of active removal of tread material, which oversteepens banks. Vegetation slough is common in eroding areas.



Active erosion, vegetation slough, and steep downcuts.

Trails in “Moderate” condition should be reviewed for spot stabilization on steep grades or in sandy portions, and trail margin marking with stones where widening is occurring. Stabilization needs are estimated at 10% of the trail length.



Trail in “Moderate” condition showing areas of stabilization needs in foreground and better condition in background.

Geological tread “armor” occurs in some places. It is apparently a weakly-cemented sandstone/siltstone layer that is relatively resistant to further erosion, when the overlying sand has been eroded. This layer may be advantageous to stabilization efforts, but is not

considered in the above recommendations. This is because its occurrence is sporadic and may not be at the final recommended design grade for trail stabilization.



Actively-eroding social trail on left, with geological armor on lower trail.

#### Stabilization Methods

Based on this field review of local methods effectiveness, adequate stabilization can be achieved using magnesium-chloride cementation on a graded base of native or imported material. The stabilized material should be at least six inches in depth, and have a well-packed base. Trail widening and cutslope steepening can be reduced by rock borders in areas having high potential for off-trail use.



Chemical trail stabilization including rock borders.

Most trails in “Poor” condition have steep, actively eroding cutslopes. Trail stabilization measures will not directly improve these cutslopes. However, tread improvement will slow their development by decreasing oversteepening and mechanical trampling, giving vegetation a better chance of re-establishment.



Steep cutslopes

Relocation of some segments would benefit the system, especially from eroding hillsides to active washes.



Social trail in wash showing minimal impacts.

## **Results**

Figure 2 graphically displays results for landscape limitations, results of the field review, and interpretations.

## Arches National Park Devil's Garden Area Trails: Trail Limitations and Current Conditions

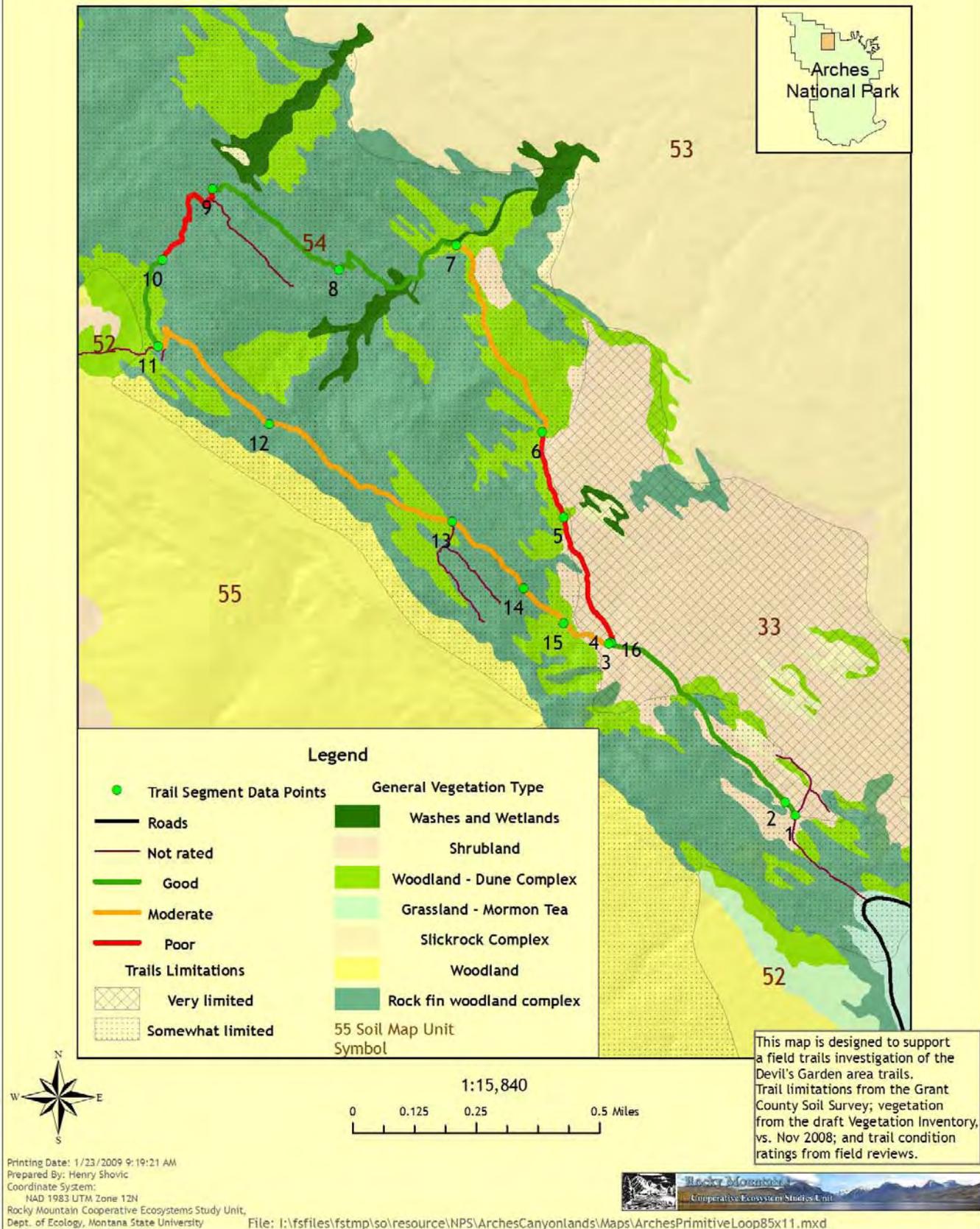


Figure 2. Geography and Trail Condition Results for Devil's Garden Trails.

## Landscape Potential – Interpretations and Limitations

The Grant County soil survey rates the entire area as having “severe” (crosshatch) or “moderate” (stipple) limitations to trail construction, use, and maintenance; in particular, the “poor” conditions on segments 4-5 and 5-6), and the “moderate” and “poor” conditions on the remainder of segments. These are based on soil properties that affect trafficability and erodibility (primarily soil texture in this area). Appendix Two contains a description of these interpretations as well as soil map unit descriptions.

General vegetation types include a significant amount of woodland developed on sand dunes (Woodland Dune Complex), especially near trails as well as areas of intermixed bedrock and woodland, based on draft vegetation data obtained from the National Park Service. These data are consistent with those given in the soil survey as well as the aerial view in Figure 1.

### Landscape Conditions - Trail Review

Ratings of trail condition in Figure 1 are based on interpretation of the data in Table 2, which in turn came from the field review data in Appendix One. Poor conditions occur on 20 % of the entire loop trail. This is particularly true on the “primitive” part of the Primitive Loop (Segments from Point 4 to Point 11, on Figure 2), with 36% in “poor” condition. Relocation of some segments would benefit the system, particularly in segment 9-10, where a social trail in a wash could be utilized. Of the four miles of reviewed trail a total of almost one mile (23 % of the total reviewed trail length) should be stabilized to reduce active erosion and encourage natural recovery of cutbanks.

Table 2. Trail Segment Ratings

Trail Segment	Trail Conditions	Trail Condition Rating	Total Segment Length (miles)	Stabilization Needs (Miles)
1-4	Surfaced trail	Good	0.6	0
4-5	Trail deflation, rutting, in loamy sand and sand. Up to 5' trail deflation; average is 2'; Low strength soil, topsoil is < 2 cm; Soil crust binds top 2-3 cm of soil, unvegetated, no crusts on cutslopes; lost material is not evident, but likely washed to low spots.; entire area is sand, likely eroded from higher sandstone cliffs; surrounding area is stable-looking except for near trail (50% soil crust; vegetation away from trail)	Poor	0.3	0.3
5-6	near wash; trail slope 20% ruts are 3.5 to 4.5 ft' deep; but a hard trail tread, possibly a geologic layer, not evidently human-stabilized; moderate deflation; partial hard trail	Poor	0.2	0.2

6-7	deflation 2-4 ft; 50% geologically stable tread; 50% sand tread Pic 151, 152 and social trail erosion	moderate	0.5	0.05
7-8	in wash (20%) or on bedrock (70%) little deflation, but lichens removed from rock; 2 ft deflation in sandy areas (10%)	Good	0.4	0
8-9	50% rock, 50% sand; soils have 20% sub-angular gravel and “natural tread armour” as noted before.	Good	0.3	0
9-10	These pictures show trail location about 20’ above wash; wash is social trail; few visible impacts in wash, but trail has 4 ft. deflation.	Poor	0.3	0.3
10-11	low impacts; slopes < 5%; deflation 2 ft. or less; soils have some gravel	Good	0.2	0
11-12	Trail is 80% on bedrock; Pic 161, 162 after leaving rock fin; eroded to bedrock 2 ft. sandy colluvium	Moderate	0.4	0.04
12-13	% on bedrock; 50% on sand, but dominantly eroded to bedrock (2 ft)	Good	0.5	0
13-14	50% eroded to bedrock (2’) 50% on sand.	Moderate	0.2	0.02
14-15	50% on bedrock (pic 165); 50% eroded to bedrock (2’ deflation)	Moderate	0.1	0.01
15-16	relatively stable; some gravel and older MGCL2 stabilized areas; some sand	Moderate	0.1	0.01
Totals			4.1	0.93

## Discussion and Conclusions

The soil survey ratings for trail limitations (which infer landscape potential) support the trail ratings based on field data (which describe landscape conditions). The results in turn support the concerns voiced by Arches National Park staff on both field condition and maintenance levels specified by current plans. Vegetation types also are consistent with the kinds of soils probably occurring in the area. These facts all support the conclusion that these landscapes are sensitive to disturbance, in fact have been significantly disturbed.

Actual trail conditions reflect not only the landscape potentials, but also effects of high use on these sensitive areas. Trail impacts (especially those in the “Poor” category) have apparently become more severe than would occur under the low level of use implied by the “primitive” designation.

These impacts are evident throughout the Devil’s Garden trail system. Active erosion will continue as cutslopes retreat, adding material to the tread, where it is mixed by traffic, and washes or sloughs into channels. Cutslopes will probably not revegetate under these conditions. Trail widening will continue in these areas, as visitors widen the trail in search of a better tread. Some form of stabilization is recommended to reduce this active erosion and increase the potential for natural revegetation.

# Appendix One

## Arches Field Review Data Primitive Loop Henry Shovic Nov 22, 2008

Reviewed Nov 20, 2008 with Jeff Troutman, NPS.

See Figure 2 in the main text body for point and segment references. This was derived from a hard-copy field map used in the review.

1. 40 ft. on right hand first junction toward Pine Tree arch. MgCL2 treated trail, using reject sand (from quarries) mixed with gravel and native material; still wet from treatment; moderately hard; mixed to at least 6 inches in depth. Pic 138

2. 140 ft. on main Landscape Arch trail, MgCL2 treated trail Pic 139

1-4 surfaced

3 pic 140 jcn with primitive trail

4. pic 141 4.5' of trail deflation, next to trail sign.

4 – 5 Trail deflation, rutting, in loamy sand and sand. Up to 5' trail deflation; average is 2'; Low strength soil, topsoil is < 2 cm; Soil crust binds top 2-3 cm of soil, unvegetated, no crusts on cutslopes; lost material is not evident, but likely washed to low spots.; entire area is sand, likely eroded from higher sandstone cliffs; area is stable-looking except for near trail (50% soil crust; vegetation away from trail)  
Pic 142, 143

Between 4 and 5 moderate deflation (rutting) 2' average

Pic 144 social trail next to fin, soil crust 60% of area on sand

Point 5. high deflation, rutting Pic 145

Pic 146, 147 near wash; trail slope 20% ruts are 3.5 to 4.5 ft' deep; but a hard trail tread, possibly a geologic layer, not evidently human-stabilized. Pic 147 shows cactus slough;

Pic 148 closeup soil crust

Pic 149 hard surface geologic material

Between 5 and 6; moderate deflation; partial hard trail tread Pic 150

Point 6 high deflation, rutting near wash

Points 6 – 7 deflation 2-4 ft; 50% naturally stable tread (cemented rock layer); 50% sand tread Pic 151, 152 and social trail erosion

Point 7 – 8 in wash (20%) or on bedrock (70%) little deflation, but lichens removed from rock; 2 ft deflation in sandy areas (10%) Pic 153; trail widening; low impact in wash

Point 8 Pic 15 from Buttslide North 200yds, 50% rock, 50% sand; soils have 20% sub-angular gravel and “natural tread armour” as noted before; social trails common along rock ribs.

Between point 8 and 9; similar to at point 8; Trail slope is up to 17%. Where steep deflation is 2'. Low impacts on shallow slopes.

Pic 154 lichen rubbed off rock on trail (indicates high use)

Between point 9 and 10; Pic 155, 156, 157 near summit  
These pictures show trail location about 20' above wash; wash is social trail; few visible impacts in wash, but trail has 4 ft. deflation.

Soils overall on the primitive loop trail: 60% sand; 10% sandy colluvium; 25% bedrock; 5% resistant rock layer; off-trail soil crust is wide-spread, locally 50% of surface is covered;

History: grazing probable before last 50 years;

From Point 11 on, not on primitive trail

Point 10 – 11 low impacts; slopes < 5%; deflation 2 ft. or less; soils have some gravel

Point 11: at Double O arch; social trails cover the area (where there isn't rock); no soil crust remains in local area.

Pic 158, 159, 160 panorama at Black arch overlook.

Between 11 and 12

Trail is 80% on bedrock; Pic 161, 162 after leaving rock fin; eroded to bedrock 2 ft. sandy colluvium

Between 12 and 13 50% on bedrock; 50% on sand, but dominantly eroded to bedrock (2 ft)

Point 13 jcn Partition Arch pictures of graffiti Pic 163, 164

Point 13 – 14 50% eroded to bedrock (2') 50% on sand.

Point 14 Reroute around Wall Arch is 50% on bedrock (pic 165); 50% eroded to bedrock (2' deflation)

Point 15 Landscape Arch trail

Between 14 and 15 similar to point 14.

Between 15 and 16 trail is relatively stable; some gravel and older MGCL2 stabilized areas; some sand

## Appendix Two

NRCS Soil Interpretation Descriptions and Map Unit Descriptions from the Grant County  
Soil Survey using SoilDataViewer software.

# Paths and Trails

Aggregation Method: Dominant Condition  
Tie-break Rule: Higher

Grand County, Utah - Central Part  
Survey Area Version and Date: 4 - 12/21/2006

Map symbol	Map unit name	Rating	Component name and % composition Rating reasons
4	Begay-Sazi complex	Not limited	Begay 65% Sazi 20%
5	Begay-Sazi-Rizno complex	Not limited	Begay 40% Rizno 20% Sazi 20%
6	Begay-Rizno complex	Not limited	Begay 60% Rizno 20%
18	Hanksville family-Badland complex	Very limited	Hanksville family 40% Slope Dusty
30	Mesa fine sandy loam, 2 to 6 percent slopes	Not limited	Mesa 75%
33	Mido loamy fine sand, 2 to 20 percent slopes	Very limited	Mido 75% Water erosion Too sandy
34	Mido-Sazi complex	Very limited	Mido 50% Water erosion Too sandy
35	Moenkopie-Rock outcrop complex	Not rated	Moenkopie 60% Rock outcrop 15%
37	Moepitz variant very stony sandy loam, 2 to 10 percent slopes	Somewhat limited	Moepitz variant 85% Large stones content
38	Muff family-Badlands complex	Very limited	Muff family 40% Slope Large stones content
39	Myton family-Rock outcrop complex	Very limited	Myton family 40% Slope Large stones content
40	Nakai fine sandy loam, 3 to 10 percent slopes	Not limited	Nakai 85%
42	Nakai-Redlands complex	Somewhat limited	Nakai 40% Too sandy
47	Redbank-Flatnose families association	Not limited	Redbank family 45%
51	Rizno-Begay complex	Not limited	Rizno 50% Begay 25%
52	Rizno-Rock outcrop complex	Not limited	Rizno 50%
53	Rock outcrop	Not rated	Rock outcrop 100%
54	Rock outcrop-Arches-Mido complex	Somewhat limited	Arches 35% Too sandy
55	Rock outcrop-Moenkopie association	Not rated	Rock outcrop 60% Moenkopie 25%
64	Shalet loam, 3 to 10 percent slopes	Somewhat limited	Shalet 80% Dusty
66	Sheppard fine sand, 2 to 10 percent slopes	Very limited	Sheppard 100% Too sandy
74	Thedalund family-Rock outcrop-Badland association	Very limited	Thedalund family, dry 55% Slope
75	Toddler-Ravola-Glenton families association	Somewhat limited	Toddler family 25% Dusty Ravola family 25% Dusty
76	Valleycity-Neiber-Rock outcrop complex	Somewhat limited	Valleycity 40% Large stones content Slope

# Paths and Trails

## Rating Options

Attribute Name: Paths and Trails

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling.

The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value to represent the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. The components in the map unit name represent the major soils within a map unit delineation. Minor components make up the balance of the map unit. Great differences in soil properties can occur between map unit components and within short distances. Minor components may be very different from the major components. Such differences could significantly affect use and management of the map unit. Minor components may or may not be documented in the database. The results of aggregation do not reflect the presence or absence of limitations of the components which are not listed in the database. An on-site investigation is required to identify the location of individual map unit components.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be generated. Aggregation must be done because, on any soil map, map units are delineated but components are not. The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

# Map Unit Description

Grand County, Utah - Central Part

[Minor map unit components are excluded from this report]

Map unit: 4 - Begay-Sazi complex

Component: Begay (65%)

The Begay component makes up 65 percent of the map unit. Slopes are 2 to 10 percent. This component is on structural benches, cuestas. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R035XY215UT Semidesert Sandy Loam (four-Wing Saltbush) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Sazi (20%)

The Sazi component makes up 20 percent of the map unit. Slopes are 2 to 10 percent. This component is on cuestas, structural benches. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R035XY215UT Semidesert Sandy Loam (four-Wing Saltbush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 35 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 5 - Begay-Sazi-Rizno complex

Component: Begay (40%)

The Begay component makes up 40 percent of the map unit. Slopes are 10 to 20 percent. This component is on cuestas, structural benches. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R035XY215UT Semidesert Sandy Loam (four-Wing Saltbush) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Rizno (20%)

The Rizno component makes up 20 percent of the map unit. Slopes are 10 to 20 percent. This component is on ridges on cuestas, ridges on structural benches. The parent material consists of eolian deposits derived from sandstone and/or residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 4 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R035XY236UT Semidesert Shallow Sandy Loam (utah Juniper-Pinyon) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Component: Sazi (20%)

The Sazi component makes up 20 percent of the map unit. Slopes are 10 to 20 percent. This component is on cuestas, structural benches. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R035XY215UT Semidesert Sandy Loam (four-Wing Saltbush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 35 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

# Map Unit Description

Grand County, Utah - Central Part

Map unit: 6 - Begay-Rizno complex

Component: Begay (60%)

The Begay component makes up 60 percent of the map unit. Slopes are 2 to 10 percent. This component is on structural benches. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R035XY215UT Semidesert Sandy Loam (four-Wing Saltbush) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Rizno (20%)

The Rizno component makes up 20 percent of the map unit. Slopes are 2 to 10 percent. This component is on ridges on structural benches. The parent material consists of eolian deposits derived from sandstone and/or residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 4 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R035XY236UT Semidesert Shallow Sandy Loam (utah Juniper-Pinyon) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map unit: 18 - Hanksville family-Badland complex

Component: Hanksville family (40%)

The Hanksville family component makes up 40 percent of the map unit. Slopes are 30 to 50 percent. This component is on cuestas, mesas. The parent material consists of colluvium derived from shale and/or residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R034XY103UT Desert Clay (castlevally Saltbush) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 9 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Badland (35%)

Generated brief soil descriptions are created for major soil components. The Badland is a miscellaneous area.

Map unit: 30 - Mesa fine sandy loam, 2 to 6 percent slopes

Component: Mesa (75%)

The Mesa component makes up 75 percent of the map unit. Slopes are 2 to 6 percent. This component is on pediments, fan terraces. The parent material consists of alluvium derived from conglomerate and/or alluvium derived from sandstone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R034XY106UT Desert Loam (shadscale) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 35 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 33 - Mido loamy fine sand, 2 to 20 percent slopes

Component: Mido (75%)

The Mido component makes up 75 percent of the map unit. Slopes are 2 to 20 percent. This component is on cuestas, structural

# Map Unit Description

Grand County, Utah - Central Part

Map unit: 33 - Mido loamy fine sand, 2 to 20 percent slopes

Component: Mido (75%)

benches. The parent material consists of eolian deposits derived from sandstone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R035XY212UT Semidesert Sand (fourwing Saltbush) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 34 - Mido-Sazi complex

Component: Mido (50%)

The Mido component makes up 50 percent of the map unit. Slopes are 2 to 20 percent. This component is on cuestas, structural benches. The parent material consists of eolian deposits derived from sandstone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R035XY212UT Semidesert Sand (fourwing Saltbush) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Sazi (30%)

The Sazi component makes up 30 percent of the map unit. Slopes are 2 to 10 percent. This component is on cuestas, structural benches. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R035XY215UT Semidesert Sandy Loam (four-Wing Saltbush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 35 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 35 - Moenkopie-Rock outcrop complex

Component: Moenkopie (60%)

The Moenkopie component makes up 60 percent of the map unit. Slopes are 3 to 20 percent. This component is on mesas, structural benches. The parent material consists of eolian deposits derived from sandstone and/or residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 5 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R035XY130UT Desert Shallow Sandy Loam (shadscale) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 18 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Rock outcrop (15%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 37 - Moepitz variant very stony sandy loam, 2 to 10 percent slopes

Component: Moepitz variant (85%)

The Moepitz variant component makes up 85 percent of the map unit. Slopes are 2 to 10 percent. This component is on alluvial fans. The parent material consists of alluvium derived from sandstone and/or colluvium derived from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of

# Map Unit Description

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Map unit: 37 - Moepitz variant very stony sandy loam, 2 to 10 percent slopes

Component: Moepitz variant (85%)

water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R034XY115UT Desert Sandy Loam (indian Ricegrass) ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 23 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 38 - Muff family-Badlands complex

Component: Muff family (40%)

The Muff family component makes up 40 percent of the map unit. Slopes are 1 to 50 percent. This component is on hills, alluvial fans. The parent material consists of alluvium derived from shale and/or colluvium derived from shale and/or residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R034XY003UT Alkali Fan (castlevalley Saltbush) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 23 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Component: Badland (30%)

Generated brief soil descriptions are created for major soil components. The Badland is a miscellaneous area.

Map unit: 39 - Myton family-Rock outcrop complex

Component: Myton family (40%)

The Myton family component makes up 40 percent of the map unit. Slopes are 50 to 70 percent. This component is on mountain slopes. The parent material consists of colluvium derived from sandstone and/or residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R035XY018UT Talus Slope (blackbrush-Shadscale) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 9 percent.

Component: Rock outcrop (25%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 40 - Nakai fine sandy loam, 3 to 10 percent slopes

Component: Nakai (85%)

The Nakai component makes up 85 percent of the map unit. Slopes are 3 to 10 percent. This component is on structural benches. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone and/or residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R034XY118UT Desert Shallow Loam (black Sagebrush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 9 percent.

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Map unit: 42 - Nakai-Redlands complex

Component: Nakai (40%)

The Nakai component makes up 40 percent of the map unit. Slopes are 1 to 8 percent. This component is on structural benches. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R034XY118UT Desert Shallow Loam (black Sagebrush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 9 percent.

Component: Redlands (30%)

The Redlands component makes up 30 percent of the map unit. Slopes are 3 to 10 percent. This component is on structural benches. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R034XY118UT Desert Shallow Loam (black Sagebrush) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 9 percent.

Map unit: 47 - Redbank-Flatnose families association

Component: Redbank family (45%)

The Redbank family component makes up 45 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains. The parent material consists of alluvium derived from sandstone and shale. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R034XY006UT Alkali Flat (black Greasewood) ecological site. Nonirrigated land capability classification is 7s. Irrigated land capability classification is 3s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 9 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Flatnose family (40%)

The Flatnose family component makes up 40 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains. The parent material consists of alluvium derived from sandstone and shale. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 42 inches during March, April, May, June. Organic matter content in the surface horizon is about 2 percent. This component is in the R034XY026UT Wet Saline Streambank (coyote Willow) ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 3s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 2 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 51 - Rizno-Begay complex

Component: Rizno (50%)

The Rizno component makes up 50 percent of the map unit. Slopes are 2 to 10 percent. This component is on ridges on cuestas, ridges on structural benches. The parent material consists of eolian deposits derived from sandstone and/or residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 4 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R035XY236UT Semidesert Shallow Sandy Loam (utah Juniper-Pinyon) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

# Map Unit Description

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Map unit: 51 - Rizno-Begay complex

Component: Begay (25%)

The Begay component makes up 25 percent of the map unit. Slopes are 2 to 10 percent. This component is on cuestas, structural benches. The parent material consists of alluvium derived from sandstone and/or eolian deposits derived from sandstone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R035XY215UT Semidesert Sandy Loam (four-Wing Saltbush) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 52 - Rizno-Rock outcrop complex

Component: Rizno (50%)

The Rizno component makes up 50 percent of the map unit. Slopes are 2 to 10 percent. This component is on cuestas, structural benches. The parent material consists of eolian deposits derived from sandstone and/or residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 4 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R035XY236UT Semidesert Shallow Sandy Loam (utah Juniper-Pinyon) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Component: Rock outcrop (25%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 53 - Rock outcrop

Component: Rock outcrop (100%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 54 - Rock outcrop-Arches-Mido complex

Component: Arches (35%)

The Arches component makes up 35 percent of the map unit. Slopes are 2 to 20 percent. This component is on cuestas, structural benches. The parent material consists of eolian deposits derived from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R035XY236UT Semidesert Shallow Sandy Loam (utah Juniper-Pinyon) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 5 percent.

Component: Rock outcrop (35%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Mido (20%)

The Mido component makes up 20 percent of the map unit. Slopes are 2 to 20 percent. This component is on cuestas, structural benches. The parent material consists of eolian deposits derived from sandstone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation

# Map Unit Description

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Map unit: 54 - Rock outcrop-Arches-Mido complex

Component: Mido (20%)

within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R035XY212UT Semidesert Sand (fourwing Saltbush) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 55 - Rock outcrop-Moenkopie association

Component: Rock outcrop (60%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: Moenkopie (25%)

The Moenkopie component makes up 25 percent of the map unit. Slopes are 3 to 20 percent. This component is on structural benches, cuestas, mesas. The parent material consists of eolian deposits derived from sandstone and/or residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 5 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R035XY229UT Semidesert Shallow Sandy Loam (black Grama) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 18 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 64 - Shalet loam, 3 to 10 percent slopes

Component: Shalet (80%)

The Shalet component makes up 80 percent of the map unit. Slopes are 3 to 10 percent. This component is on structural benches, cuestas. The parent material consists of residuum weathered from sandstone and shale. Depth to a root restrictive layer, bedrock, paralithic, is 5 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R034XY121UT Desert Shallow Loam (shadscale) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 9 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 66 - Sheppard fine sand, 2 to 10 percent slopes

Component: Sheppard (100%)

The Sheppard component makes up 100 percent of the map unit. Slopes are 2 to 10 percent. This component is on valleys, alluvial fans. The parent material consists of eolian deposits derived from sandstone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R034XY115UT Desert Sandy Loam (indian Ricegrass) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 5 percent.

Map unit: 74 - Thedalund family-Rock outcrop-Badland association

Component: Thedalund family, dry (55%)

The Thedalund family, dry component makes up 55 percent of the map unit. Slopes are 30 to 50 percent. This component is on escarpments, pediments. The parent material consists of colluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter

# Map Unit Description

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Map unit: 74 - Thedalund family-Rock outcrop-Badland association

Component: Thedalund family, dry (55%)

content in the surface horizon is about 0 percent. This component is in the R034XY230UT Semidesert Shallow Loam (salina Wildrye) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Badland (15%)

Generated brief soil descriptions are created for major soil components. The Badland is a miscellaneous area.

Component: Rock outcrop (15%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 75 - Toddler-Ravola-Glenton families association

Component: Ravola family (25%)

The Ravola family component makes up 25 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains. The parent material consists of alluvium derived from sandstone and shale. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R034XY006UT Alkali Flat (black Greasewood) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 35 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Toddler family (25%)

The Toddler family component makes up 25 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains, drainageways. The parent material consists of alluvium derived from sandstone and shale. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R034XY003UT Alkali Fan (castlevalley Saltbush) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 9 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Glenton family (20%)

The Glenton family component makes up 20 percent of the map unit. Slopes are 0 to 3 percent. This component is on drainageways, flood plains. The parent material consists of alluvium derived from sandstone and shale. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R034XY003UT Alkali Fan (castlevalley Saltbush) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 35 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 76 - Valleycity-Neiber-Rock outcrop complex

Component: Valleycity (40%)

The Valleycity component makes up 40 percent of the map unit. Slopes are 10 to 25 percent. This component is on ridges, hogbacks, structural benches. The parent material consists of colluvium derived from sandstone and/or residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, lithic, is 7 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon

# Map Unit Description

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Map unit: 76 - Valleycity-Neiber-Rock outcrop complex

Component: Valleycity (40%)

is about 1 percent. This component is in the R034XY130UT Desert Shallow Sandy Loam (shadscale) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 35 percent.

Component: Neiber (20%)

The Neiber component makes up 20 percent of the map unit. Slopes are 2 to 15 percent. This component is on structural benches. The parent material consists of alluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 0 percent. This component is in the R034XY109UT Desert Loamy Clay (shadscale) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 25 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Rock outcrop (15%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

## Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

The Map Unit Description (Brief, Generated) report displays a generated description of the major soils that occur in a map unit. Descriptions of non-soil (miscellaneous areas) and minor map unit components are not included. This description is generated from the underlying soil attribute data.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.