

Project Report: Canyon Lands Fort Bottom 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 Canyonlands Fort Bottom Area trail system. 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 San Juan County soil survey, geology data, and the existing trail inventory for this area.

## Methods

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

## Analysis

### Landscape Description

Figure 1 shows the landscapes of the trail area. Slopes are gentle to steep, with the main trail (blue) following a rocky ridge to the river, and numerous social trails (in red) on steeper slopes. The underlying landform is an eroded, colluvial slope having little vegetation. The gently-sloping alluvial “bottom” is heavily vegetated with Tamarask and other shrubs. This area can be reached by a primitive and difficult 4WD road, which limits user density. However, the Green River provides most access, and users from the river are probably responsible for most social trail development.



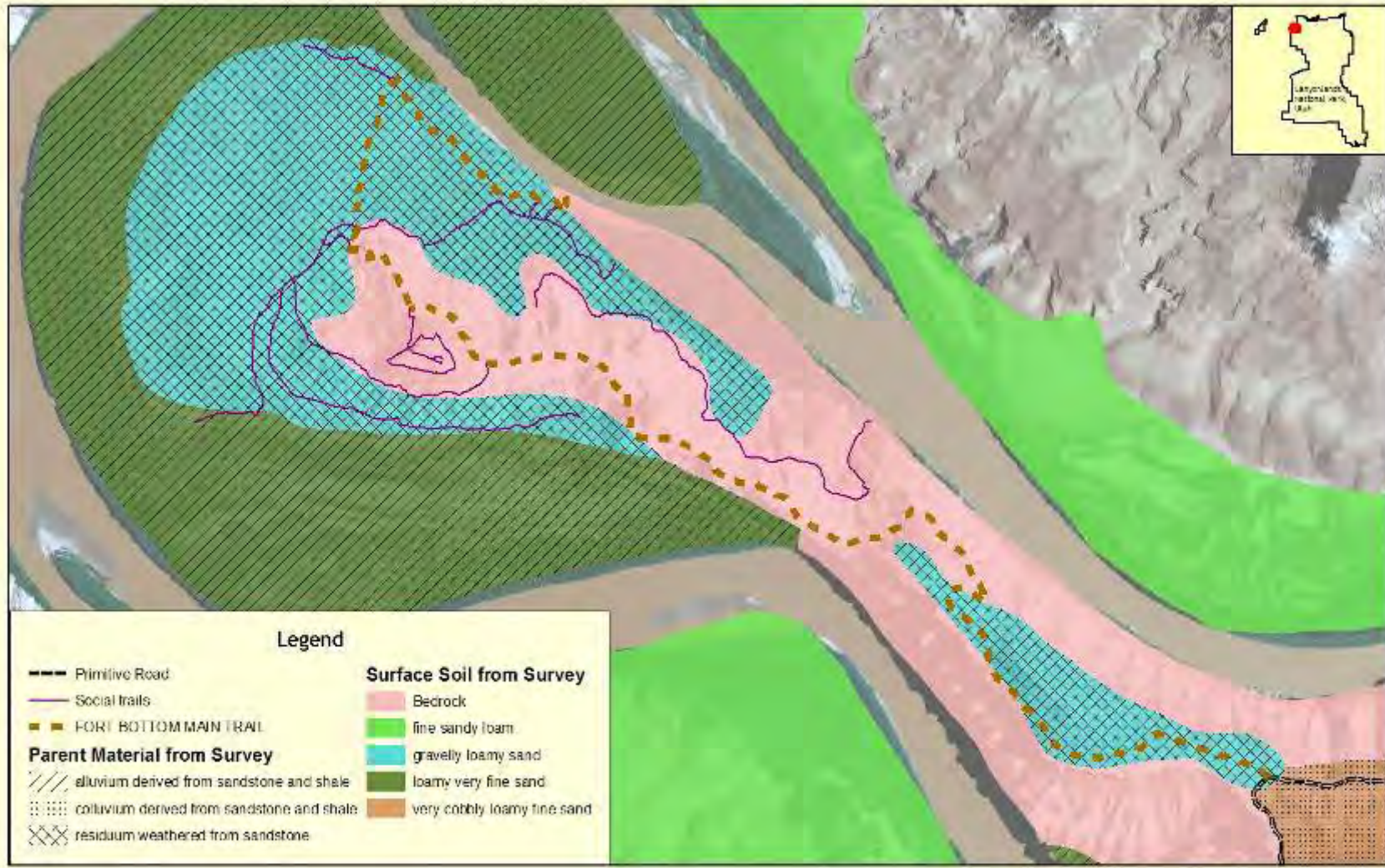
Figure 1. Landscapes of the Fort Bottom Area

The San Juan County soil survey shows most of the area as either bedrock or residuum weathered from sandstone (Figure 2). Surface texture is rated as absent or gravelly loamy sand. However, based on the field review, soils on trails are gravelly (primarily on the main trail) and silty on the southern non-system trails. The area mapped as “residuum weathered from sandstone” is actually primarily poorly-indurated siltstone, eroding in a “badlands” manner. This shows as lighter gray areas in Figure 1. Lower slopes are covered with desert pavement, consisting of small planar gravels covering silty residuum. This “pavement” is quite fragile, and is easily disturbed by walking.

Off-trail soil biologic crust is intermittent, with an average of 20% surface cover. Crust is apparently absent on steeper slopes, probably because of rapid erosion and deposition.

Most of the steeper area is mapped as Moenkopi Formation (siltstones and fine-grained sandstones) (Figure 3) The Chinle Formation (sandstone and siltstone, conglomeratic sandstone) caps the narrow ridge and associated rocky sideslopes). Coarse-textured alluvium occurs near the river.

Canyonlands National Park Fort Bottom Area:  
Soil Texture and Surficial Material From the San Juan County Soil Survey



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 Dept. of Ecology, Montana State University  
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Figure 2 Map of the Study Area with Soil Parent Material and Surface Soil Texture from The San Juan County Soil Survey.



Soils on the Main Fort Bottom Trail eastern part – from field review



Soils on the non-system trails on the southern side, showing absence of bio-crust – from field review



Desert pavement on relatively-stable parts of the western “badlands” area.

## Canyonlands National Park Fort Bottom Area: Geology and Slope



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Figure 3. Fort Bottom Area Geology and Slope



## Trail Inventory: Sensitivity and Condition

Representative trail segments were reviewed in the field. Appendix One contains the GPS track and field review data. Observed trail segments were rated for “sensitivity”. This term is defined as the synthesis of landscape and soil properties that affects the response of a trail to user impacts. It is generally separate from “condition” which rates the existing trail properties.

Trails having “Low” sensitivity require little maintenance. They are relatively stable (either on bedrock, mechanically stabilized, or in relatively-stable colluvium).



A trail having “Low” sensitivity. Slopes are gentle, and soils have a stable matrix of mixed materials.

Trails with “High” sensitivity are unstable even with low use, and are likely to become very erosive if subjected to high, sustained use. They have potential for 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 having “High” sensitivity.

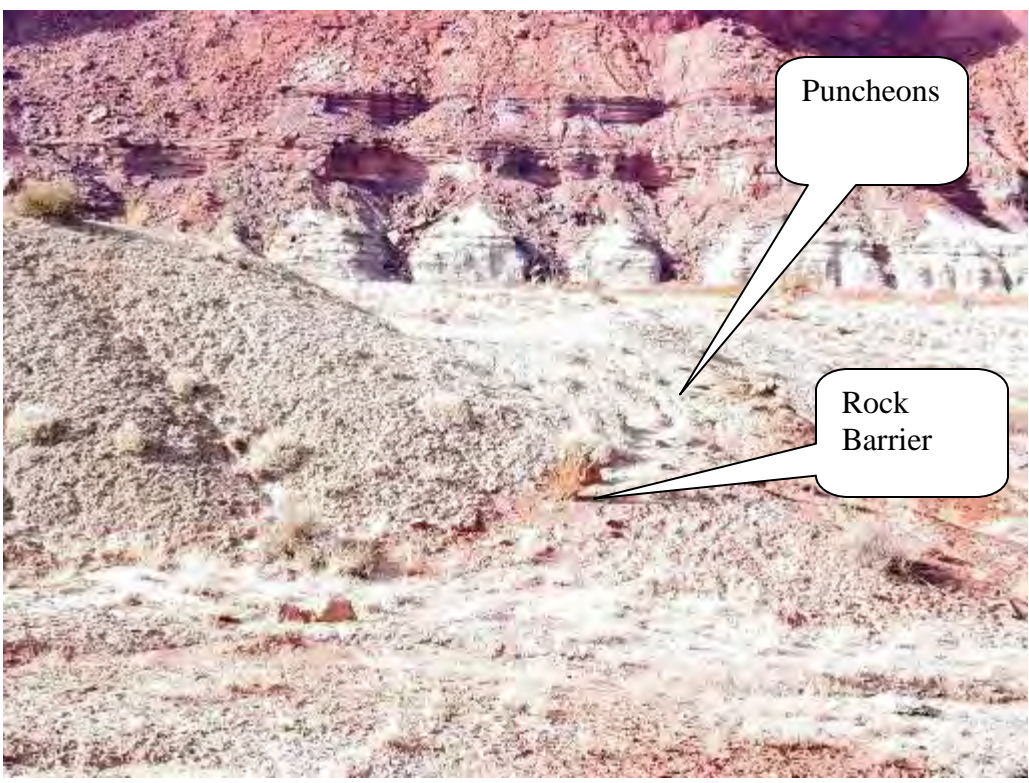
An existing inventory of the Fort Bottom Trail segments shows trail condition. This inventory was completed by NPS staff (K. Carpenter). Present condition was rated from “Poor” to “Good”.

#### Stabilization Methods

Observed stabilization methods include rock borders to define trail tread and reduce off-trail use, rock barriers to discourage social trail use, and “puncheons”, which are small holes excavated in the tread, probably to discourage use and to reduce erosion.



Rock Borders



Trail Barriers.

## Results and Discussion

Figure 4 graphically displays results for results of the sensitivity field review and the existing trails inventory. Figure 5 shows the trail sensitivity and condition overlaid on slope and geology. Figure 6 shows a perspective view of the trails.

The Fort Bottom Main Trail is generally in good shape (low erosion, tread is stable, little trail widening) and is also in less sensitive material (primarily sandstone with some siltstone). It was apparently an old 4WD road which has been converted to a trail. It has rock borders in places and waterbars on steep slopes. Though it appears to be located on steep slopes (Figure 5), it actually stays primarily on a narrow, flat ridgetop, on sandstone. Where on steep sideslopes, the trail follows an excavated 4WD road. This road is significantly eroded, but the trail itself has been stabilized with waterbars.

The Spur3 trail is also relatively stable, and is not being widened, but is located in erosive material. It is highly visible, and appears to be located on steep slopes (Figure 5) but actually “snakes around” on gently-sloping benches.



Spur3 Trail

Cirque 3 and Cirque trails both are rated as being in “Poor” condition, as well as being highly sensitive. They are both on very steep slopes, and are in the erodible Moenkapi formation (Figure5, 6).

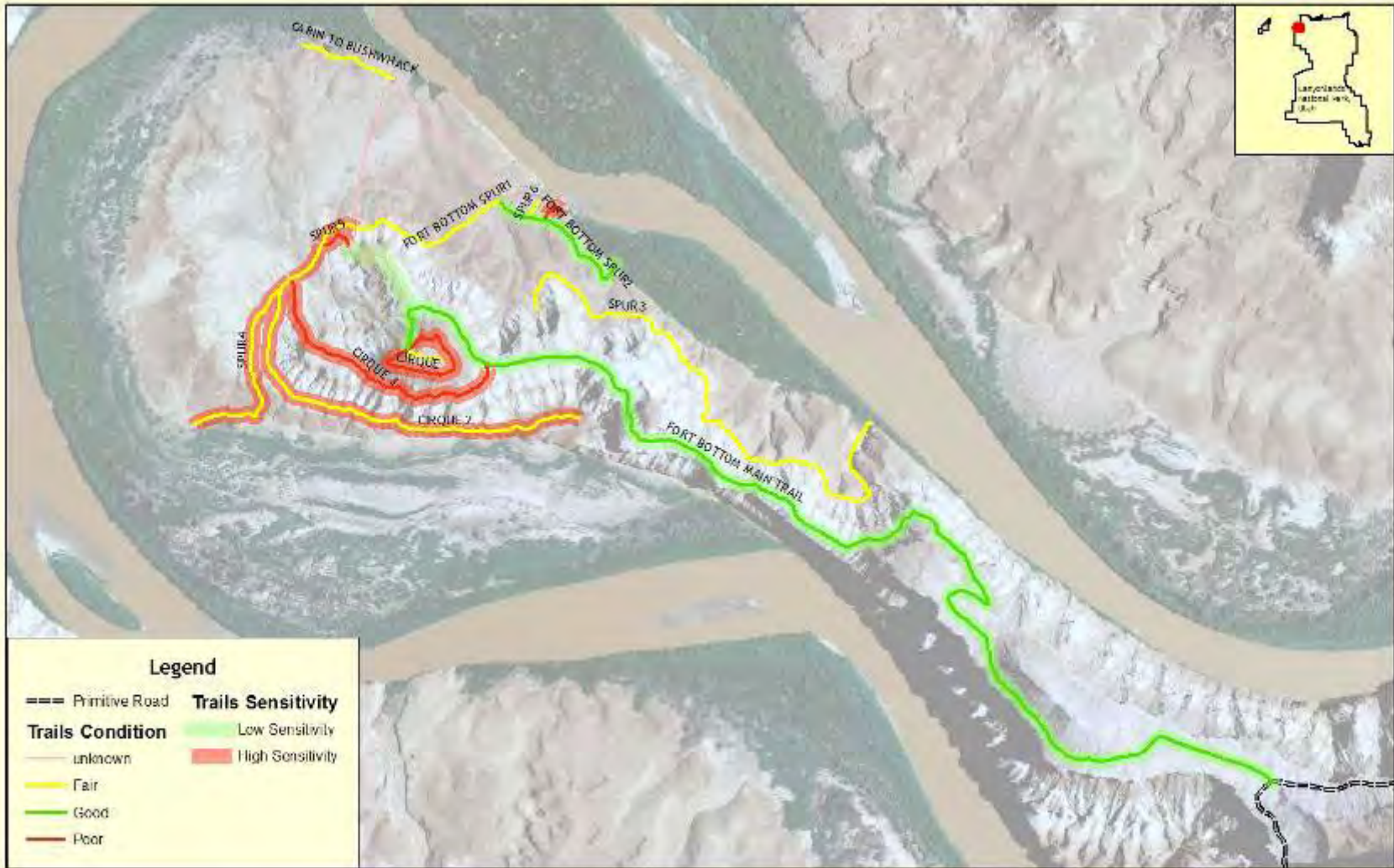
Spur4, Spur5, and Cirque 2 trails are rated as being in “Fair” condition. This is probably correct, as they are in a truly “badland” landscape. The trail itself was actually difficult to find in some places (Appendix One has the GPS track). The trail prism is probably covered by eroding material every year. It was hazardous to traverse in places, especially above steep washes.



Fort Bottom Trails Cirque 2 Trail prism on badland area.

The lower trails (Cabin to Bushwhack, Spur6, and Fort Bottom Spur2) appear to be relatively stable, since they are located in alluvium rather than on the Moenkopi formation (Figure 5). However, Fort Bottom Spur1 goes through a transition zone between the two geologic types, and is probably eroded on sloping segments. It is of lower sensitivity than the trails near Spur4. One un-named spur near Spur5, however, appears to climb steeply from the river, and is in “Poor” condition.

## Canyonlands National Park Fort Bottom Area: Trail Inventory and Analysis



**Legend**

|                         |                             |
|-------------------------|-----------------------------|
| --- Primitive Road      | <b>Trails Sensitivity</b>   |
| <b>Trails Condition</b> | Light Green Low Sensitivity |
| — unknown               | Red High Sensitivity        |
| Yellow Fair             |                             |
| Green Good              |                             |
| Red Poor                |                             |



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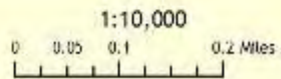
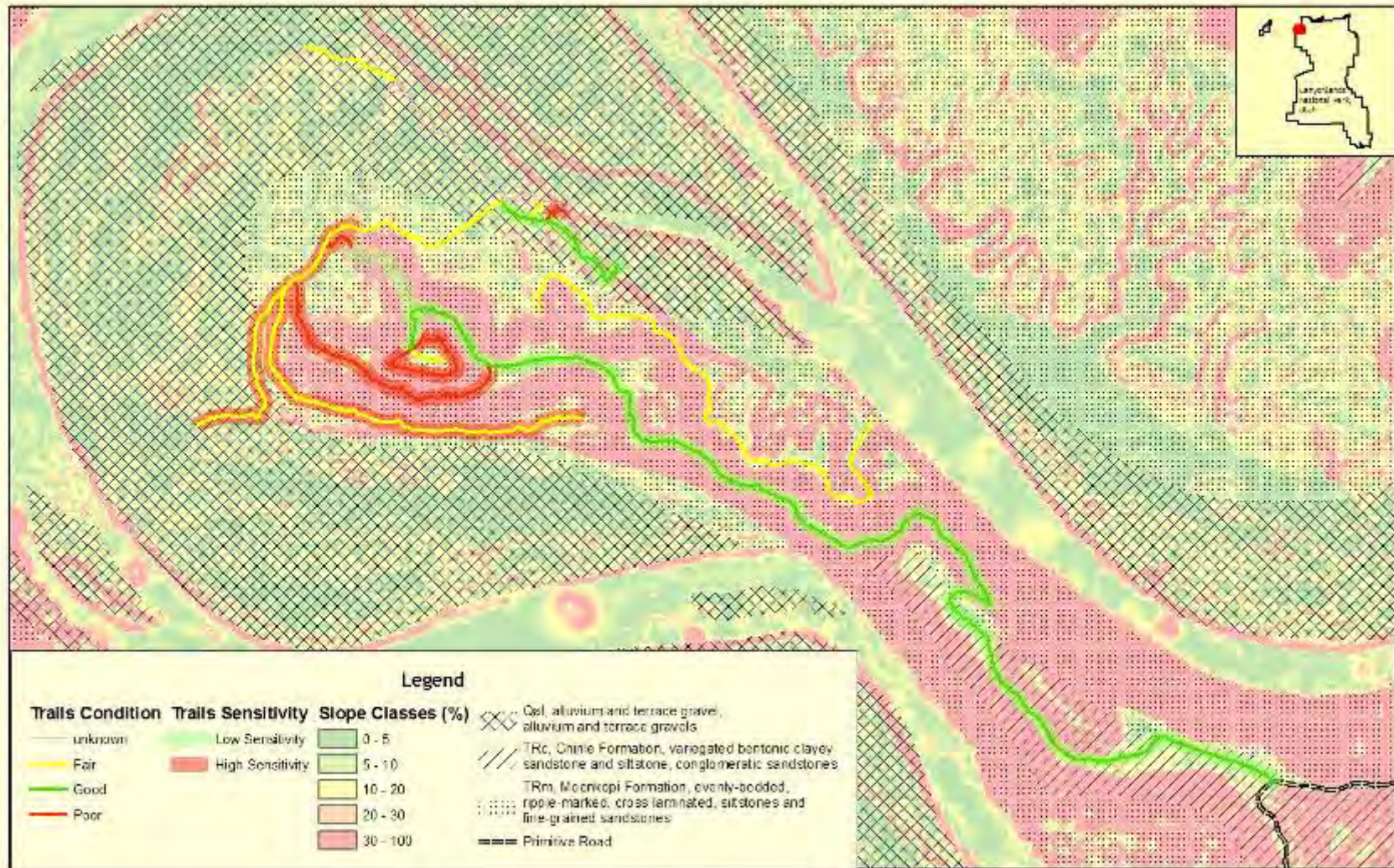


Figure 4. Trail Condition and Sensitivity for Fort Bottom Trail



### Canyonlands National Park Fort Bottom Area: Geology, Slope, and Trail Condition/Sensitivity



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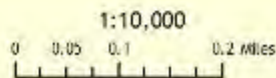


Figure 5. Geology, Slope, and Trails in the Fort Bottom Area



Figure 6. Perspective view of the Fort Bottom Trail (highly erodible area in the red-dashed polygon)

## Conclusions and Recommendations

Based on this sample and the trail inventory, the steeper, erodible parts of the Moenkopi formation appear to have the highest hazards for resource protection and visitor safety. Figure 6 contains a dashed polygon which shows the approximate extent of the area.

Soil conditions identified in this field review compared with the San Juan Soil Survey show that the Survey is not very accurate in this area. Trail limitations presented in the Survey are probably too conservative, and do not reflect the actual character of the area. Geology and Slope (Figure 5) offer a better correlation with condition/sensitivity. Trails in the Moenkopi formation and on slopes greater than 10% appear to have higher sensitivity and poorer condition.

If the management objective is to reduce resource impacts the use and creation of social trails should be discouraged. Because of the nature of the underlying soil, social trails on the north side are highly visible (Spur3 and Fort Bottom Spur1). On steeper slopes social trails can be hazardous, and contribute to destruction of bio crust as visitors wander looking for the trail prism or slip off the tread.

Rock borders are effective at keeping visitors on the Fort Bottom Main trail. On other trails rock barriers are generally small and ineffective (probably because of the “primitive” management goals in the area, and absence of readily-available rock). Puncheons, though an effective way of deterring use for some visitors, are probably not very effective since tread erosion is not a large factor here and side-slope slough probably will cover them in a short time.

However, if use is reduced trails on the southern side (Cirque 2) may “self-heal” as rapid side slough covers the tread. Trail markers and frequent enforcement may also reduce impacts.

## Appendix One

Field Notes  
Fort Bottom Trail System  
Canyonlands N. P.  
H. Shovic  
Nov 22 and 23, 2008

Waypoints are from GPS and are shown on the map (Figure 7 below), using the field COMMENTS. Pictures are shown by reference number.

There is a quarry on Mineral Bottom Road; mostly weathered shale with some poorly-indurated sandstone. Soils on this mesa are clayey. Just west of this quarry, there is a sandstone butte, with potential crush site, but material is likely to have poor durability.

WP 1 is the beginning of the trail. Pictures 188, 189

Between WP 1 and 2, pictures 190, 191 in shale

WP 2 Panoramic picture 192

WP 3 has no data.

WP 4 looking down at social trail Pic 193

Shows trail in crumbly shale – highly visible, but little erosion evident.

The main trail is in good shape and stable from 4 to 5

WP 5 trail east of 5 that shows rated “unknown” on the map is good shape, eroded 2 inches on sandstone/shale; pic 194 shows a representative segment

WP 5 – 6 Short Red trail segment; Social trail puncheoned (small shovel holes to break up trail); inch of erosion

WP 6 – 11 Yellow trail below the red segment is in weathered shale, easily eroded. Some puncheons, some small rock barriers; Soils are silty with some fine sand.

In this area, desert pavement is common on redder rock types, but on light-colored shales, soil is barren.

WP 6, 7, and 8 are at the same location.

WP 6-9 trail is very difficult to follow; poorly marked, eroded, sloughed. Note GPS track is off trail. Soils are silty with some fine sand.

WP 9 desert pavement, pic 195, 196 fragile area, friable sandstone over erodible weathered shale. Soils are silty with some fine sand.

WP 12 on contour; trail has almost disappeared due to slough. Sideslopes up to 40%; hazardous to walk on; in friable, erodible weathered shale (silty); soil is nearly barren.

WP 10 soil is silty with desert pavement, except for trail tread; very silty weathered shale; pics 197, 198

On the N side, much more gravel, pavement, stones in matrix; S side erodible weathered shale.

On the darker colored rock layers, vegetation, pavement, sandstone fragments; less erodible;

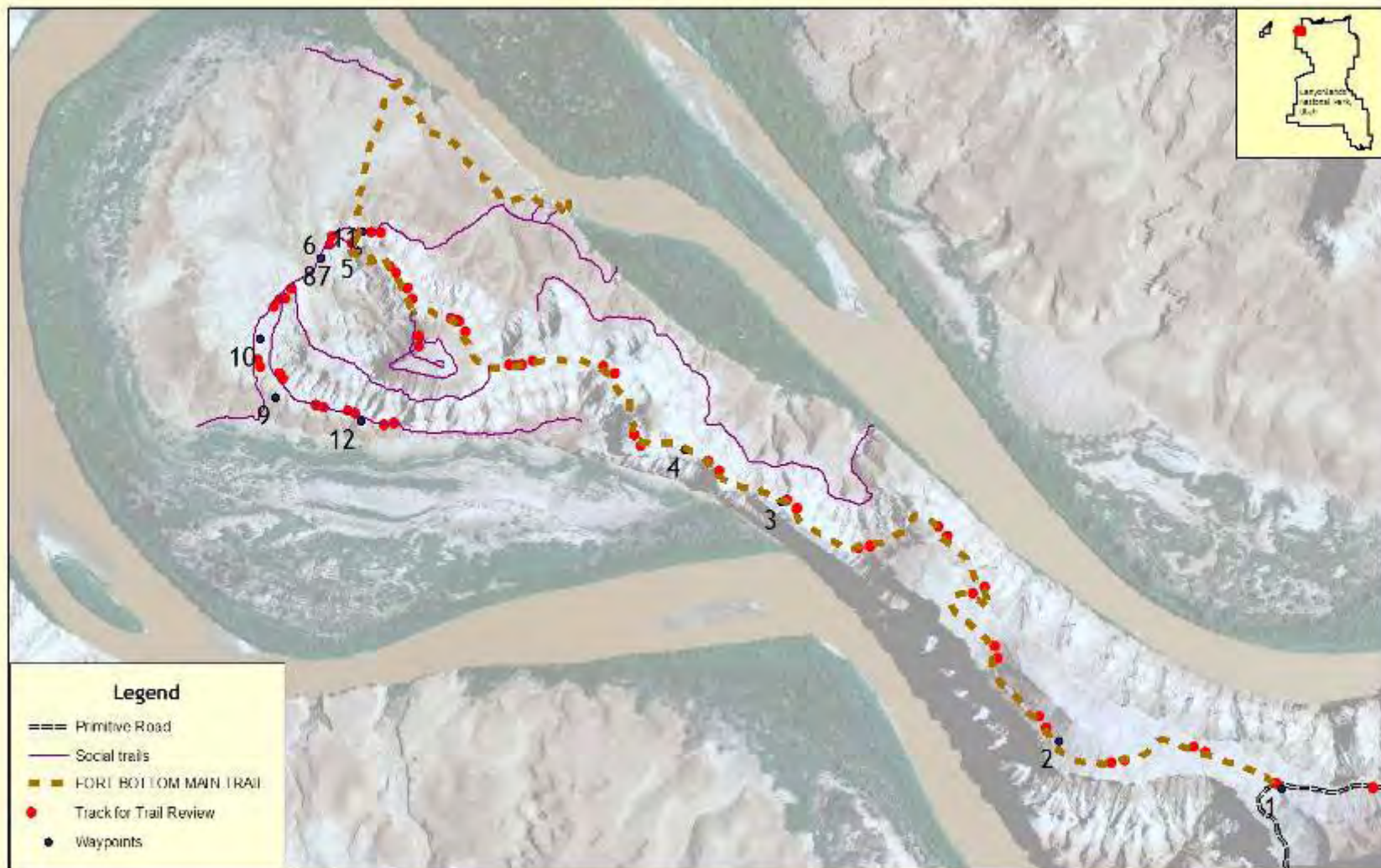
It is where light colored shales occur; there is erosion problems; badland topography

WP 11 end of social trail with a small barrier; at least three social trails lead away from here. Pic 199

At WP 11 continuation of social trail, but well maintained, and a series of rocks have been placed to keep people on the trail. Eroded up to 6 inches, but now relatively stable; Pic 200

Picture looking back at the red-rated trail near WP 12; close to WP 4; pic 201 Hard to see tread, because highly erosive soils have covered it.; self recovering; no recent use this year; possibly should be barricaded or signed.

# Canyonlands National Park Fort Bottom Area: Trail Review Data



### Legend

- === Primitive Road
- Social trails
- FORT BOTTOM MAIN TRAIL
- Track for Trail Review
- Waypoints



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0 0.05 0.1 0.2 Miles

Figure 7. Fort Bottom Trail Review Data Locations



Photos



188



189



190



191



192



193



194



195



196



197



198



199



200



201