Project Report: Canyon Lands Salt Creek Road
Field Review, Analysis, Conclusions, and Recommendations
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Rocky Mountain Cooperative Ecosystems Study Unit
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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 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 Salt Creek road.

Specific objectives for this review included:

1. Review the Horse Canyon reroute area for impacts and potentials.
2. Review the entire road from the gate to Peekaboo Campsite for impacts and potentials
3. Review the proposed reroute for feasibility and potential improvement of resource protection.

Methods

This set of trail interpretations is based on a synthesis of data from a field review using GPS and photographs (Appendix One), maps, spatial data, and interviews with Canyonlands National Park staff.

Analysis

Landscape Description

Figure 1 shows the landscapes of the Salt Creek valley (looking from South to North). Slopes are gentle to steep, with the main road following a following a vegetated stream course and associated flood plain. Uplands are derived from the Cedar Mesa Sandstone with very sandy regolith, and most of the lowland is composed of very sandy alluvium and wind-deposited sand with some river gravels. The road itself is about 3 miles long. About 80% is in the active stream channel of Salt Creek. Flooding is apparently common and significant.

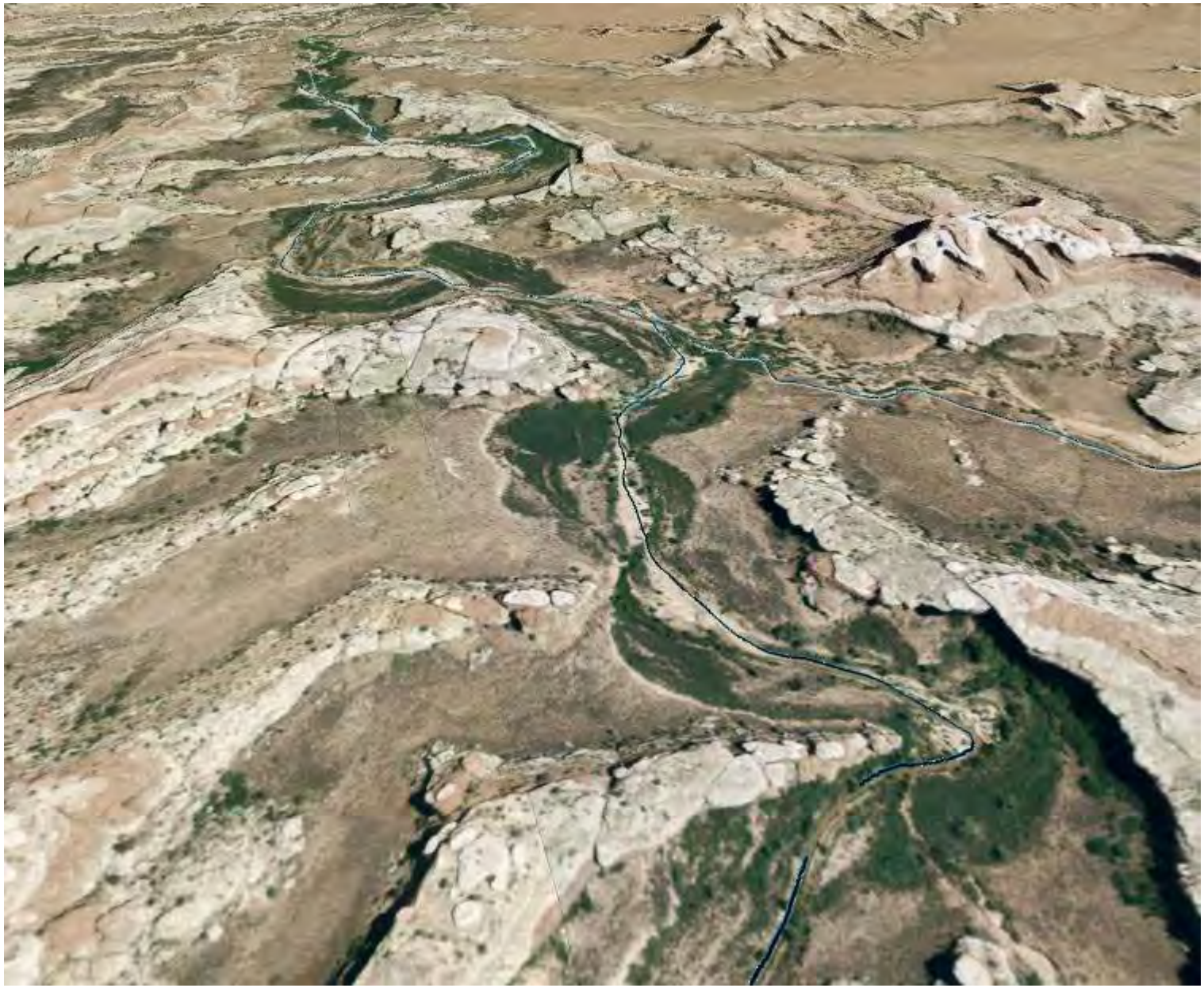

Figure 1. Landscapes of the Salt Creek Road Area, looking from south to north.

Soil materials in the vicinity of the stream are primarily alluvium and wind-deposited sand, modified by floodwaters (Appendix One). All soils are extremely sandy with occasional cobble or gravel layers. These kinds of soils have low productivity and fertility, and low resistance to erosion.

Sandy soils at Peekaboo Campground

Evidence of flooding below the campground in Salt Creek

Resource Analysis

Figure 2 shows the project area and salient review analysis by location. It is based on the data in Appendix One. See the following discussion for each marked point or area.

Figure 2 is below.

Canyonlands National Park:
Salt Creek Road Review

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Prepared By: Henry Shovic (hshovic@montana.edu)
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Coordinate System:
NAD 1983 UTM Zone 12N
File: CANYSaltCreekMap.mxd

This map is designed to support a field trails investigation of the Salt Creek road in Canyonlands National Park. Points are referenced in the report text.

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Stream Characteristics

Salt Creek was flowing as of April 12, 2009 from Point 23 to 57 (about 2 miles of a total of 3). It is apparently one of only two perennial streams in Canyonlands National Park (the other is the Colorado River). The floodway's upper channel (from Point 20 to 44 or about one mile) has a substrate of gravel and cobbles with a well defined and incised channel, and is sandy with a well-defined channel to 57, then a poorly defined channel occurs below point 57. This may indicate stream scour is likely the primary flood erosive mechanism above Point 57 with deposition occurring below that point and most occurring below Point 57.

Gravel and cobble stream bed on upper channel

Sandy stream bed midway on lower channel


Sandy, poorly-defined stream bed on the lower channel.

Three stream terrace levels were observed in this study.

- The Floodway (including the active channel) has no vegetation and probably flows every year.

Floodway

- The Low Terrace (represented by Point 49) is about five feet above the Floodway. This terrace shows evidence of occasional flooding and has a very sandy substrate.

Low Terrace

- The High Terrace (represented by Point 55 and 60) is about eight to thirty feet above the Floodway and shows no evidence of recent flooding. It has a very sandy substrate.


High Terrace

Impacts to Stream and Riparian Vegetation

Vehicle impacts appear to be significant in the flowing part of the stream (Point 23 to 57). Disturbance is significant from even a very slow traverse (less than 1 mph), with apparent erosion of side banks, exposure of roots, and turbidity. These are all probably detrimental to bank vegetation and invertebrate health.

Erosion, turbidity, and root exposure from low velocity vehicle traverse

Large holes occur in the active channel. These are apparently related to vehicle use, similar to the formation of potholes or washboards on other native surface roads. These holes can be large enough to affect stream flow (Point 40).

Pothole probably caused by repeated vehicle traverse

Stream channel characteristics appear to be different in areas without the impacts of vehicle traffic. At Point 56, a segment of stream channel shows no evidence of vehicle use. The channel is significantly different than the nearby road/channel. No large holes or unconnected pools occur in the un-driven area. In nearby stream channels with no apparent vehicle use, vegetation is present in the channel and it is less disrupted by large holes.

Stream character with vehicle use

Stream character with vehicle use (bathtub ring area)

Stream character without vehicle use

Stream character and vegetation without vehicle use

Stream character and vegetation without vehicle use

Potential Recovery

Removing vehicle traffic from channels or roads was observed to be enough to initiate vegetative recovery. At Point 20, past the gate closure, cut banks are sloughing towards a stable slope. At Point 21, an unused road has vegetation and incipient biological soil crust.

Natural sloughing and filling of unused road

Natural revegetation and biologic soil crust formation on unused road

Road Reroute

The current road follows the active stream channel in the Floodway for 80% of the project area from the gate (Point 16) to the closed gate near Peekaboo Campground (Point 20) (Figure 2). A proposed re-route of the road is shown in Figure 2 (red dashed line). The re-route follows terraces surrounding the current road, with at least four intersections with the stream channel/current road.

This re-route track was not marked on the ground (with exception of the Horse Canyon intersection discussed below), but its location was well enough defined to review in the field and on digital aerial imagery. Generally, the upper ½ of the re-route (south of Point 57) is on or near the Low Terrace. Below that point it is primarily on the High Terrace. Re-route/current road intersections as specified on the map are almost all on the Low Terrace.

The Horse Canyon reroute area

A particular potential problem area was identified on the Horse Canyon road (Point 44 on Figure 2).

Figure 3 (below) shows a closeup of the area.

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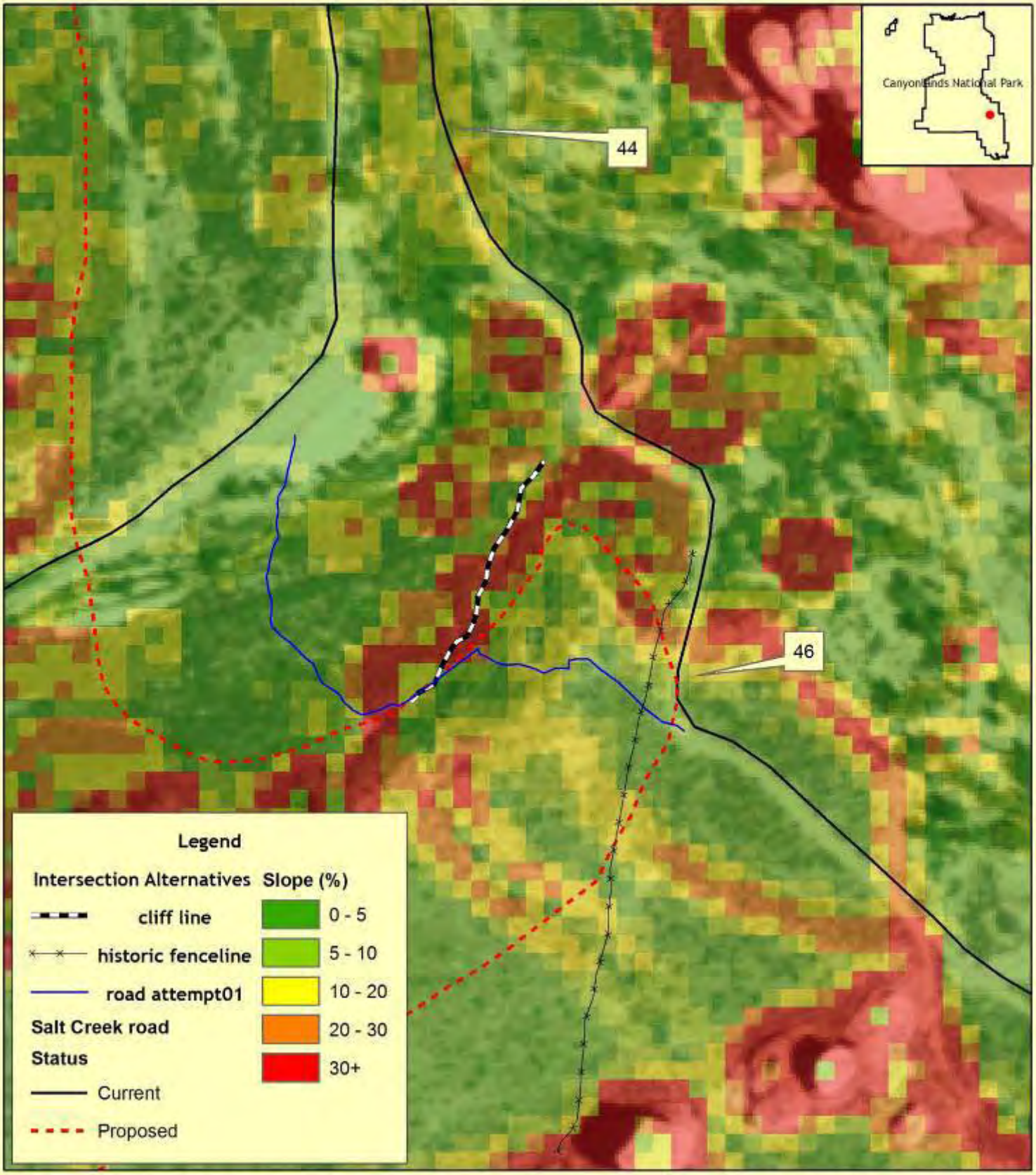

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Horse Canyon road transects a series of steep banks (Point 44 to 46) in extremely sandy material. It has been eroded by vehicles and by intermittent stream flow down the road. Where slopes are gentle, little erosion has occurred.

Erosion on Horse Canyon road on steep sections

Erosion on Horse Canyon road on gently-sloping area

Two potential reroutes have been identified (blue and dashed red in Figure 3). Each appears to have potential to avoid the current road location, but both come very close to an observed cliff line, which probably extends south past the symbolized location on Figure 3, based on the aerial imagery. Both also appear to traverse steep sandy bluffs (slopes > 30%).

Overview showing steep, sandy bluff and Horse Canyon road below

Therefore, both bedrock and steep, erosive slopes are likely to be potential problems for any road re-route through this area. Though it appears feasible, it will probably require engineering analysis and road mitigation measures such as surfacing, drainage structures, and grade control.

Conclusions

The above analysis of the field review data can be used to make some conclusions about the Salt Creek road system.

The Salt Creek riparian system is a rare resource in Canyonlands National Park. It is likely the only example of a small perennial system in the entire Park. The surrounding upland is an arid, infertile, and erosive environment, and the valley produces significantly different vegetation and probably associated wildlife from that upland. Increasing aridity from climate change will only make this resource more rare. The stream system is flood-prone and any mitigation measures will need to take this environment into account.

There are significant impacts to the hydrologic system from vehicle use. About 2/3 of the system is impacted. Effects include deterioration in the nature of the stream bed, nearby vegetation, and water quality. However, local observation indicates removing this vehicle use will probably result in significant natural recovery.

The proposed re-route has potential to reduce stream impacts. However, it is not optimal. The upper 2/3 of the stream is probably the most likely to contain affected resources but, its present location is probably not effective in that upper 2/3 of the road system, because of flooding potential on the low terrace and channelization of intersections. The re-route location on the lower 1/3 is probably more effective since it is primarily on the upper terrace, but the channel is poorly-defined there and may not benefit much from removal of use.

At Horse Canyon, the road re-route will probably be effective at reducing erosion. However, because of bedrock, the steep slopes, erosive soils, and arid environment it will be significantly more expensive to design and build than roads on less-sloping ground.

Overall, it appears that other options should be considered to protect this resource. These might include re-designing the re-route to take advantage of higher terraces (with significant increases in costs due to probable excavation of bedrock). A second alternative might consider a re-route to Horse Canyon and Peekaboo campground on the uplands surrounding the Salt Creek valley rather than within its perimeter.

Appendix One

Field Notes
Salt Creek Road
Canyonlands N. P.
H. Shovic
April 13, 2009

Waypoints are from GPS and are shown on Figure 4. Pictures are in a separate folder.

Point 016 pic 41, at gate

Point 018 is campsite Campground is on sand dune material (loose)
Pic 42 - 46

Closed road,Pic 47, 49 sand starting to reclaim itself

Pic 50 shows banks starting to slough.

Point 021 closed road incipient cryptogamic soil at the base pic 51, 52, 53

Point 022 Salt Creek appears not driven on; rocky bed pic 54

Salt Creek above campground trail is dry

023 bank from Salt Creek to Campground; relatively stable bank (cobbles)
Bank is 5' high. Pic 55
024 dry channels present, prob recent flooding on this terrace
025 other side of reroute, going east. Goes up a steep (20%) bank; a dry terrace above it (gravelly)

The lower terrace is relatively stable, in sand, older flood plain, 4 feet above road; no evidence of overflow; soils probably have developed from sand (wind-blown), because of uniform grain size and no alluvial patterns seen other than on stream banks.

028 flood debris in tree (picture); reeds are bent over. Pic 56

040 disturbance in creek; gravel bottom ; There is vegetation on bank; medium textured stream bed.; Entire width of stream bed is disturbed every vehicle. Water was turbid; pic 57 And active erosion and disturbance by vehicles pic60, 61, 62, 63 even when driving 1 mph….

042 1.5 ft. deep pools probably created by vehicles; There is bank vegetation. (related to driving because don't exist where no vehicles drive) pic 59

043 Confluence area to Horse Canyon very sandy banks; rocky stream bottom pic 64

044 confluence of Salt and Horse Creeks picture deeply eroded Horse Canyon road; streams come down this road; 7 ft. high banks pic 65

Pit blocking off the road.

045 Erosion not evident here. Upland bench (all sand) pic 66

046 Reroute beginning from road (stakes) pic 67

047 steep bank (sand) above active flood plain; but stabilizing a new road cut in this material would be difficult (reference existing erosion and rilling by stream) pic 68

This reroute will be expensive; existing materials poor; veg poor; needs engineering.

048 in main stream channel (there is water, drive through most of the way); gravel base but sandy banks and upper flood terrace.

049 on reroute area; on a terrace with an active channel; appears no better than in channel.

S of 049 needs removal of large boulders to get it out of the flood plain.

Other side of 049 is a wide flat terrace, sandy, will need surface but high out of floodway. No flood evidence. 9 feet above floodway.

Pic 69 and 70 around here on un-disturbed area where road not in stream.

050 road leaves stream channel. 3 ft bank pic 71

051 back in stream channel, now a sandy channel.

052 back in stream channel

5 ft. bank where reroute might enter stream again.

053 bathtub ring rocks no quicksand today; sand bottom; banks are eroded. Pic 72, 73

054 picture; sandy, well vegetated bench, could be used for reroute; excellent cryptogamic soil crust here. Pic 75

055 across road, medium terrace which has no obvious flood evidence, but 30 ft. lower than the bench on which I am standing. Reroute around 55 is on the south site, not here, bathtub rings indicate floods almost to the level of that terrace, so potentially floodable; where creek crossing, reroute is in the medium term flood terrace, so crossings could become channels; also slope is variable. Suggest reroute at 054. Pic 76, 77

At cutoff between 55 and 57: walked undriven part of stream; shows effects of no vehicle use; pic 79 is undriven; pic 78 is at corner of cutoff

057 comes out of wash again, completely dry and sand filled; up on a low bank

058 back into the wash; come back in 20 ft later form a low bank; back into wash. Dry channel; sandy flood deposits.

059 From here out, the reroute is not very far above the wash; very dispersed channel here, dispersed flow; multiple floodways pic 80

060 sandy, flat, sagebrush terrace for reroute pic 81

061 very dispersed flow;, no channel, some wind erosion; final 400 ft of road before gate is out of the wash.

Figure 3 is below.

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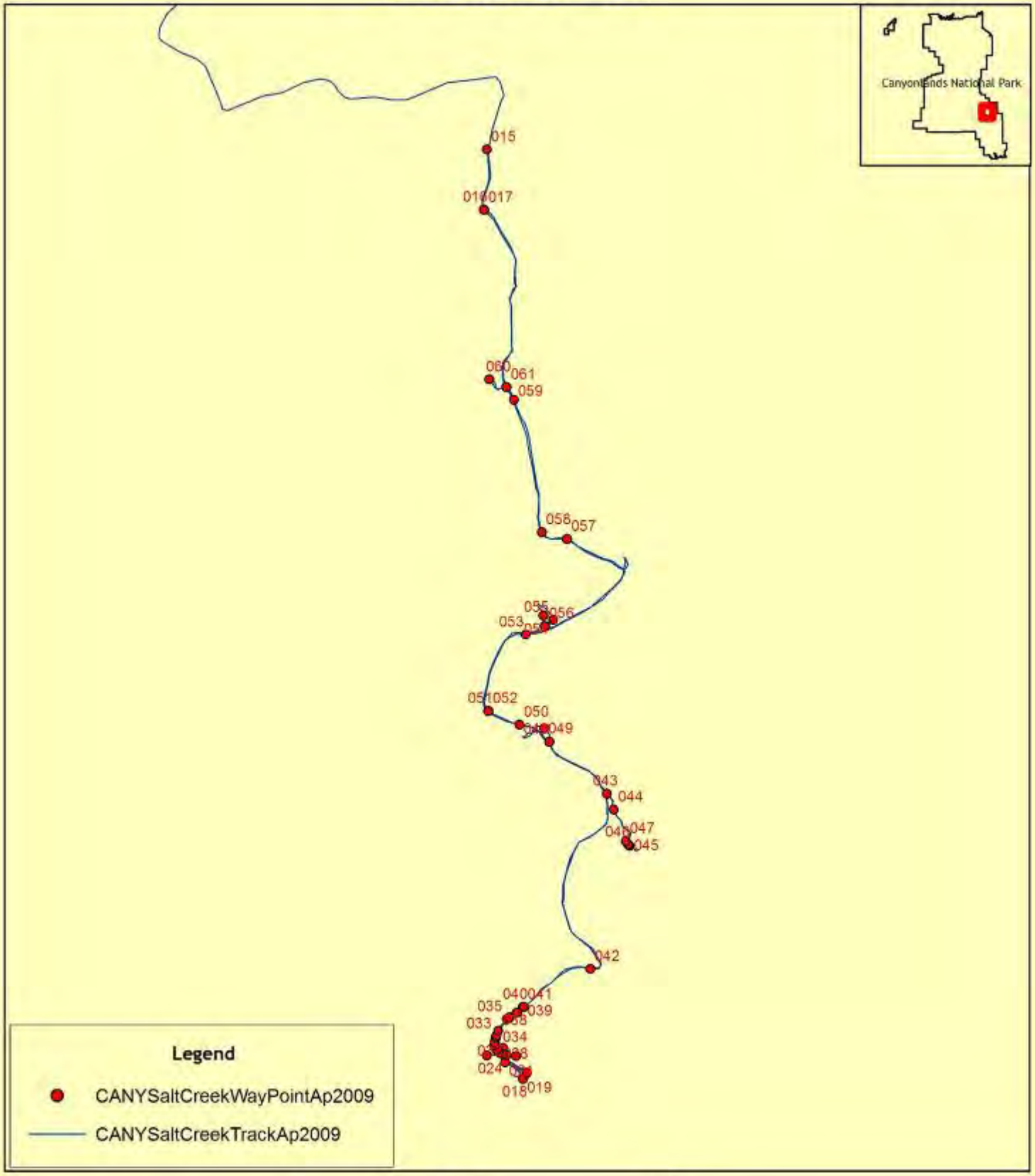

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