Visual Survey of Potential Erosion Points on Royal Gorge Trails Bordering Serene Lakes

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Purpose of the Survey

There are trails on the Royal Gorge property that border on Serene Lakes that have been traditionally used by skiers, hikers, mountain bikers and equestrians. The trails are the remnants of old logging roads that have been used by the Royal Gorge Ski Resort as ski trails. The trails were never designed or maintained with multi-use in mind and as a result do not address the specific use requirements for different categories of trail users. This task is currently being explored by the new owners of the property, the Truckee-Donner Land Trust (TDLT).

In order to get a better idea of what condition the trails are in and what types of remediation might be necessary, this visual survey was compiled. The authors are not experts in trail design and the survey is not meant as an expert evaluation of the trails. The purpose of the study is to provide visual pictures of areas on the trail that are subject to water drainage and erosion effects. Descriptions of the images are included to aid the reader in understanding the situation at each potential erosion point. The descriptions are made by the authors as a common sense explanation of how each site appears. The survey concentrates on the Reindeer and Switchback ski trails that border the lakes because they are the primary trails that cross the drainage into the Serene Lakes.

Authors Observations

Having performed the survey, the authors feel that although they are not trail experts, they do have a lot of experience with open space areas and can make a few observations.

- Despite the fact that the trails were not designed according to best practices, overall they are in pretty good shape and resilient to much of the wear from current and past use
- Many of the erosion points in the survey do appear to resist erosion well
- There are points on the trail that do show the effects of erosion due to improper design, but they all seem amenable to correction with proper remediation techniques that are being planned by the TDLT

For more information concerning this survey
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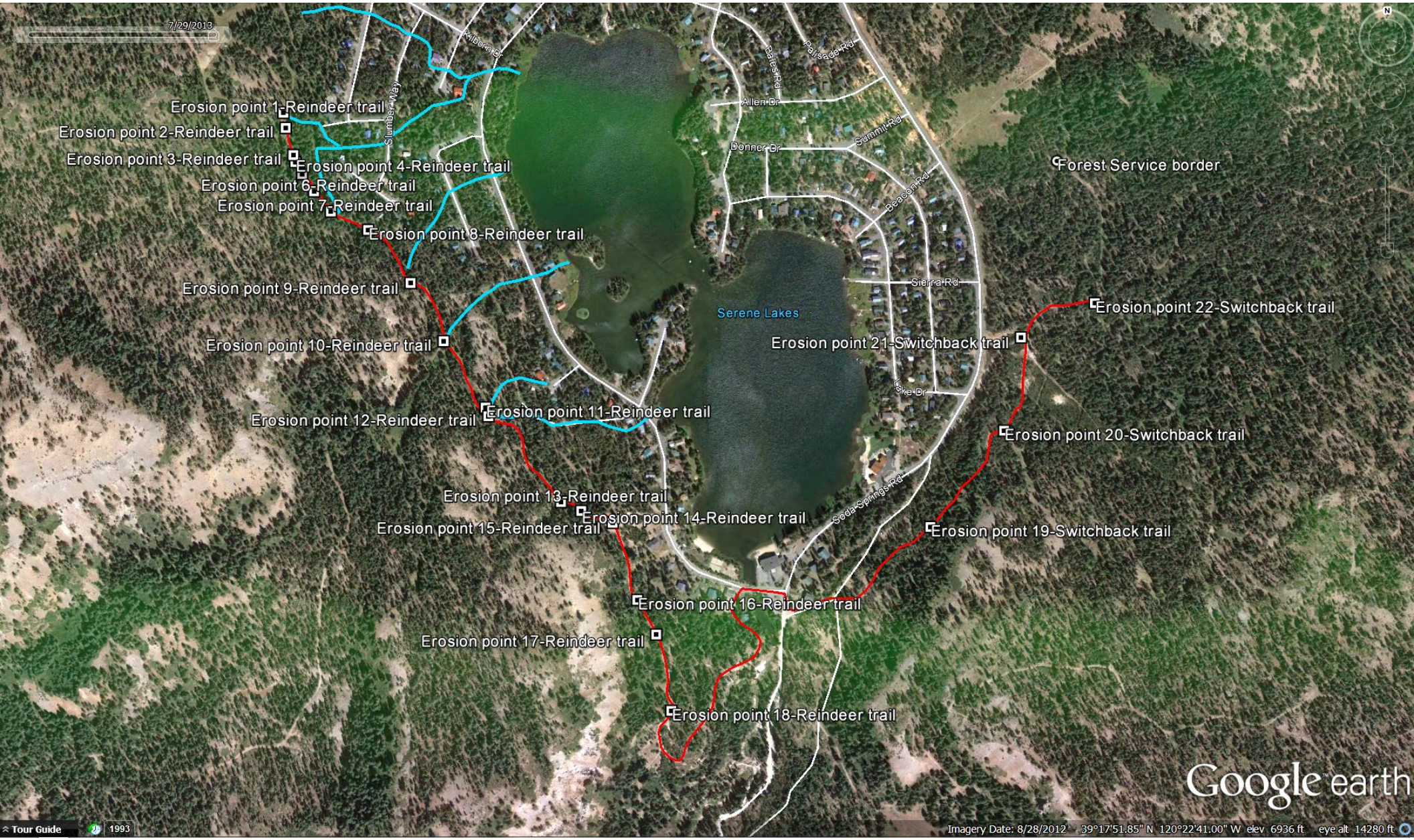


This satellite map shows the track of the Reindeer and Switchback trails that border the southern end of the Serene Lakes community and identifies the potential erosion points observed on the trails. The blue lines indicate the seasonal drainage creeks from the trail that flow into Lake Serena, the source of drinking water for Serene lakes.

This satellite map shows a closer view the track of the Reindeer trail and the seasonal drainage creeks that drain into Lake Serena.

Getting Some Perspective

Just a little mental exercise to put things in perspective:

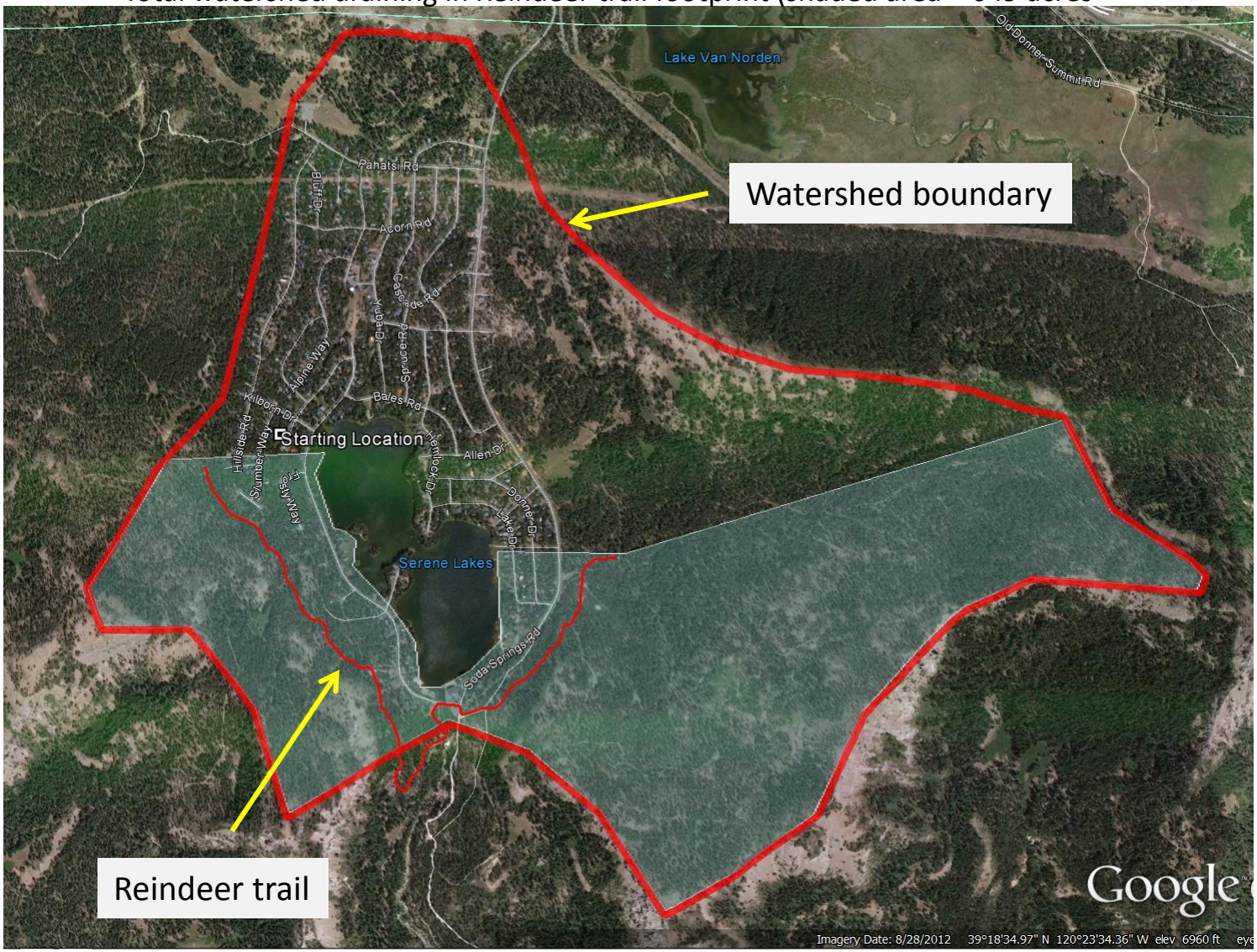
Reindeer trail crossing Serene Lakes watershed:
Length – 1.78 miles = 9,413 ft
Area: 9,413 ft x 12 ft (avg width) = 112,956 sq ft = 2.6 acre

Area of potential erosion points on Reindeer trail
~13,000 sq ft = .3 acre

Entire Reindeer trail contribution to drainage
2.6 acre / 649 acre = **.004 or .4 %**

Erosion points contribution to drainage
.3acre / 649 acre = **.0005 or .05%**

Total watershed draining in Reindeer trail footprint (shaded area = 649 acres



Erosion Point 1

Drainage: Lake Serena

View: Upslope Reindeer trail at this point is relatively flat with very little wear showing with some erosion occurring across the trail where the Kat's Walk connector crosses the trail. This could be easily armored to remediate any erosion. This is a heavily used trail by both hikers and bikers and wears very well. It is wide, has two well establish treads and has good straight sight lines.

View: Upslope Kat's Walk connector trail drains straight down drainage line across Reindeer trail. Natural erosion does occur on the connector trail. Not really heavily used by mountain bikes or horses. Cross drainage would help.

Erosion Point 2

Drainage: Lake Serena

View: South on trail Reindeer trail at this point is relatively flat with very little wear showing with some erosion occurring across the trail where a seasonal drainage creek runs (wet through June). This is a heavily used trail by both hikers and bikers and wears very well. It is wide, has two well establish treads and has good straight sight lines.

View: Upslope This seasonal drainage crosses Reindeer trail and does show some erosion. It is flat and hikers and mountain bikes have little impact. It could easily be armored with rock and gravel.

Erosion Point 3

Drainage: Lake Serena

View: North along trail Reindeer trail dips at this point and shows little wear. The slope of the dip is shallow and does not require braking for a mountain bike rider. The trail has been armored with large gravel which has proven effective in mitigating any erosion. This is a heavily used trail by both hikers and bikers and wears very well. It is wide, has two well establish treads and has good straight sight lines.

View: Upslope The drainage at this point is on a shallow slope that shows some natural erosion effects.

View: Downslope

Erosion Point 4

View: North along trail Reindeer trail is flat at this point and shows very little wear. The trail has been armored with large gravel which has proven effective in mitigating any erosion. This is a heavily used trail by both hikers and bikers and wears very well. It is wide, has two well establish treads and has good straight sight lines.

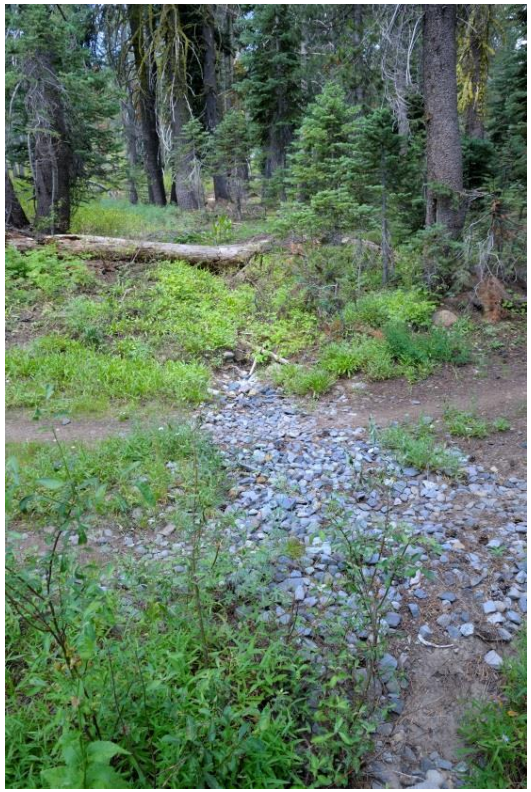
View: Upslope The drainage slope is relatively shallow above trail.

View: Downslope This track drains into the diversionary ditch behind Kidd Court.

Erosion Point 5

Drainage: Lake Serena

View: North along trail Reindeer trail is flat at this point and shows little wear. The trail has been armored with large gravel which has proven effective in mitigating any erosion. This is a heavily used trail by both hikers and bikers and wears very well. It is wide, has two well establish treads and has good straight sight lines.



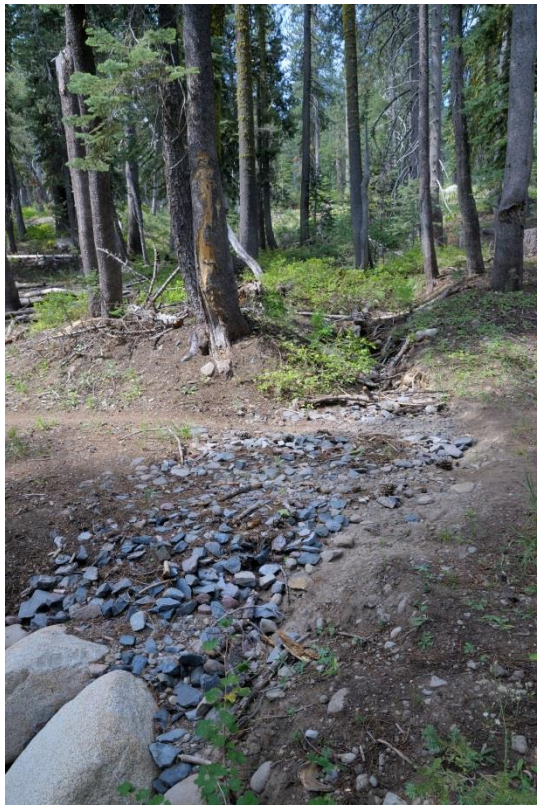
View: Upslope Drainage slope is relatively shallow above trail

View: Downslope This track runs into the diversionary ditch behind Kidd Ct

Erosion Point 6

Drainage: Lake Serena

View: South along trail Reindeer trail is flat at this point and shows little wear. The trail has been armored with large gravel which has proven effective in mitigating any erosion. This is a heavily used trail by both hikers and bikers and wears very well. It is wide, has two well establish treads and has good straight sight lines.



View: Upslope Drainage slope is relatively shallow above trail

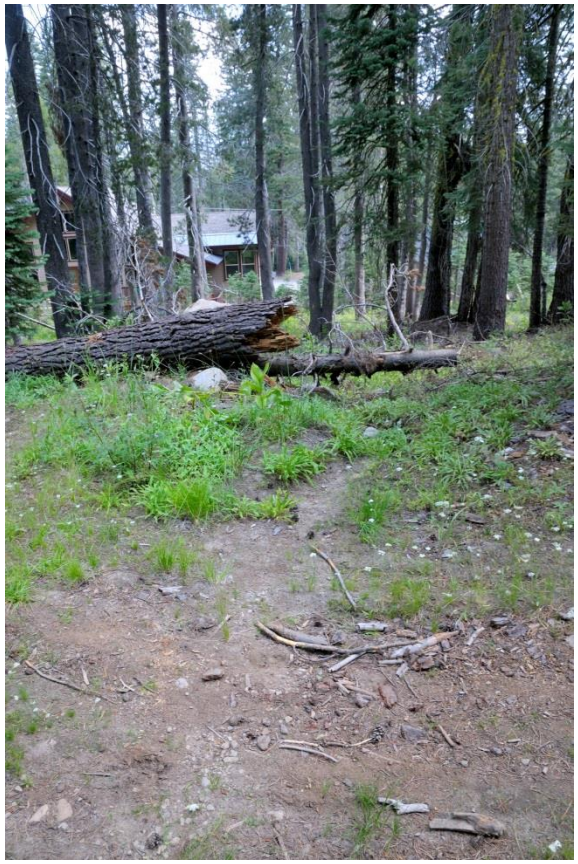
View: Downslope This track runs into the diversionary ditch behind Kidd Ct

Erosion Point 7

Drainage: Lake Serena

View: North along trail Reindeer trail is flat at this point and shows very little wear even though it has not been armored. Drainage at this point is relatively light. This is a heavily used trail by both hikers and bikers and wears very well. It is wide, has two well establish treads and has good straight sight lines.

View: Upslope Drainage slope is relatively shallow above trail



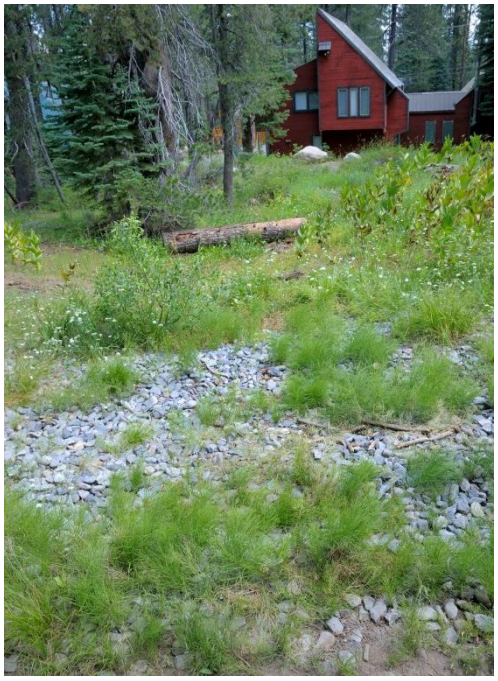
View: Downslope This track runs into the diversionary ditch behind Kidd Ct

Erosion Point 8

Drainage: Lake Serena

View: North along trail Reindeer trail is flat with a slight rise at this point and shows little wear. The trail has been armored with large gravel which has proven effective in mitigating any erosion. This is a heavily used trail by both hikers and bikers and wears very well. It is wide, has two well establish treads and has good straight sight lines.

View: Upslope Drainage slope is relatively shallow above trail



View: Downslope This track runs into the diversionary ditch behind Kidd Ct

Erosion Point 9

Drainage: Lake Serena

View: North along trail Reindeer trail climbs significantly at this point. The soil on the trail is loose after it dries out in July and braking by mountain bikers going downhill is required which could enhance erosion. This section of trail will require remediation with cross drainage and grade modifications to minimize braking activity. This trail drains into the diversionary ditch behind Kidd Ct.

Erosion Point 10

Drainage: Lake Serena

View: South along trail This is a major intersection of Reindeer and Halfhitch trails. It is flat and shows little wear. The trail is wide and has straight sightlines in all directions.

View: Upslope Drainage above trail is a shallow grade.

View: Downslope Drainage below trail is almost flat.

View: Upslope There is a natural drainage track that crosses the trail with little impact.

Erosion Point 11

Drainage: Lake Serena

View: Upslope This section of the Reindeer trail is flat but shows signs of significant drainage across it. The tread is somewhat deteriorated and will need compaction and drainage control remediation.

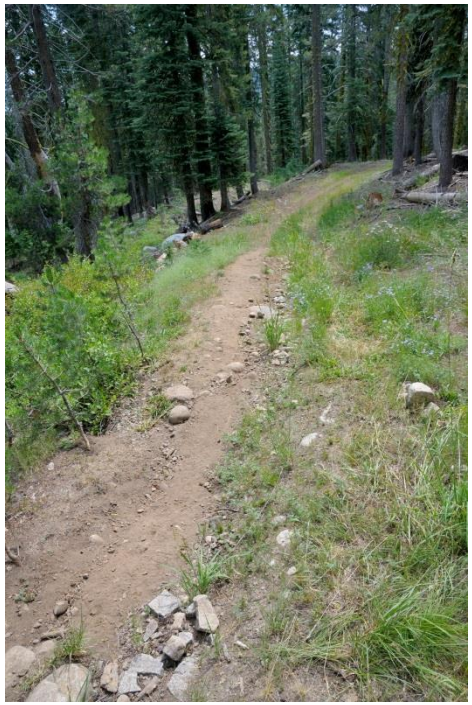
View: Downslope The drainage below the trail is relatively steep. The drainage runs into a diversionary ditch

View: Downslope The drainage ditch below the trail

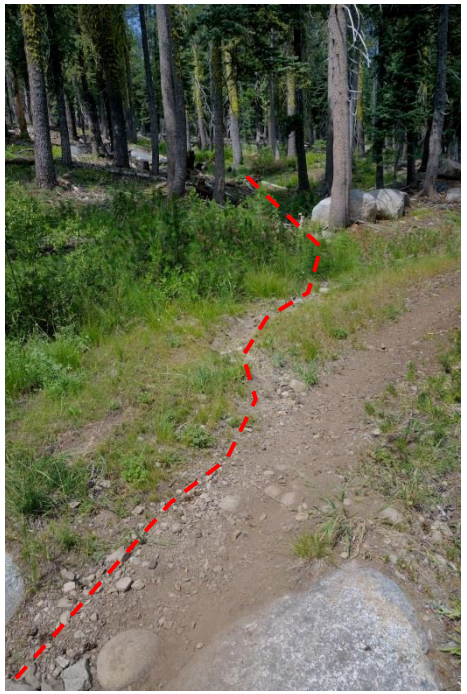
Erosion Point 12

Drainage: Lake Serena

View: North along trail (rising).



View: South along trail (falling).

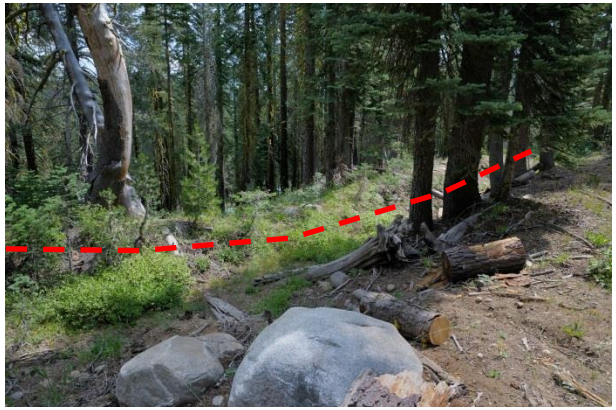


View: Upslope

Reindeer trail drops relatively steeply at this point. It would require strong braking by mountain bikes which could enhance erosion. There is only a single tread which is somewhat deteriorated. Drainage follows the trail for about 100 ft. This section of the trail would require drainage remediation and grade modifications to prevent severe braking.

View: Downslope Drains into diversionary ditch

View: Downslope Drains into diversionary ditch

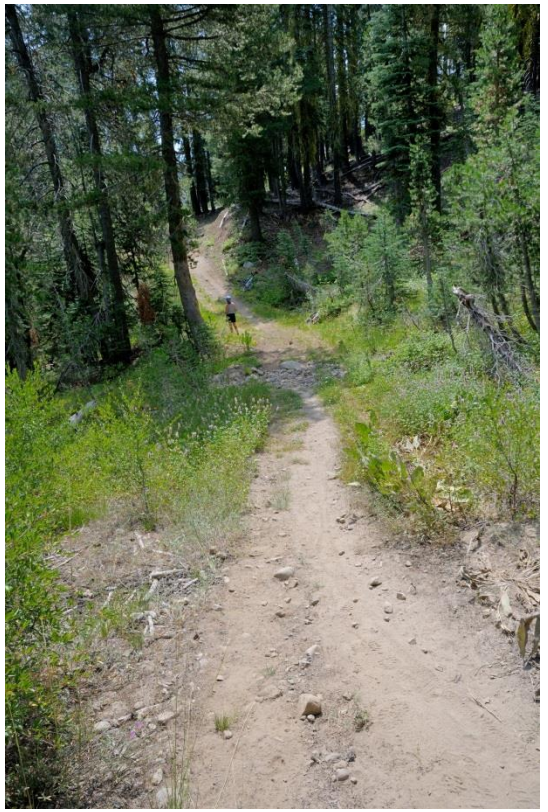


View: Downslope Drains into diversionary ditch

Erosion Point 13

Drainage: Lake Dulzura

View: North along trail. The point is a large dip in trail that is relatively steep on each side. It requires mountain bikes to brake in both directions which could enhance erosion. The trail will require drainage remediation and grade modification.



View: South along trail. Single track with some tread deterioration.

View: Upslope Trail shows significant wear from drainage

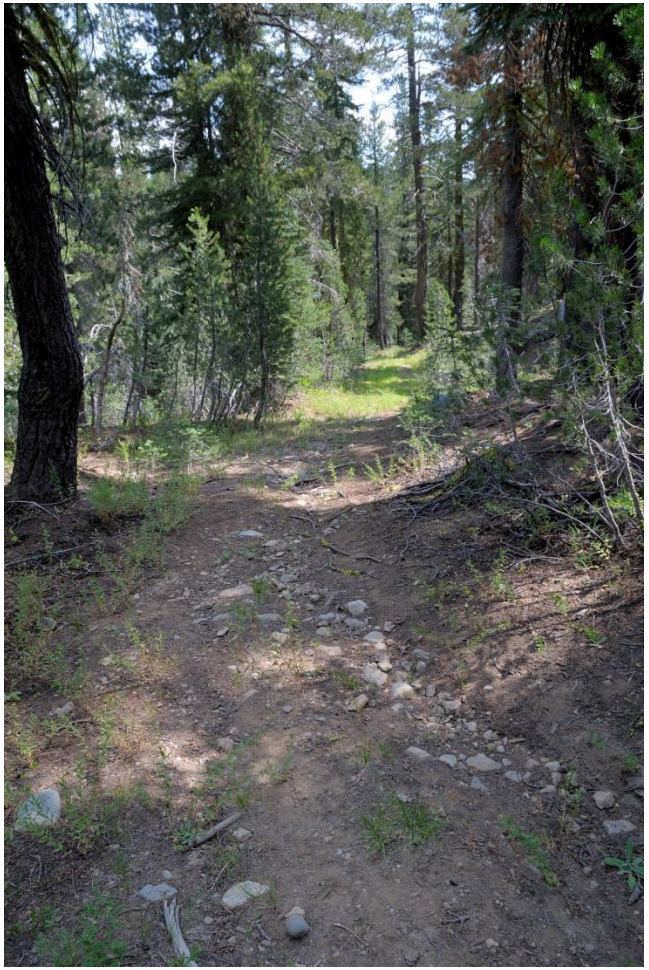
View: Downslope

Erosion Point 14

Drainage: Lake Dulzura

View: North along trail. The trail rises here and the soil is loose when it dries out in July. It requires breaking by mountain bikes which could enhance erosion. It will require drainage remediation and grade modification.

View: Upslope Soil in this area is loose when it is dry.



View: Downslope Drainage is steep and straight. Shows erosion wear. Will require drainage remediation.

Erosion Point 15

Drainage: Lake Dulzura

View: South along trail. The trail at this point is a shallow slope that does not require mountain bikes to brake. The trail is in good shape but the upslope and downslope are natuarally eroded.

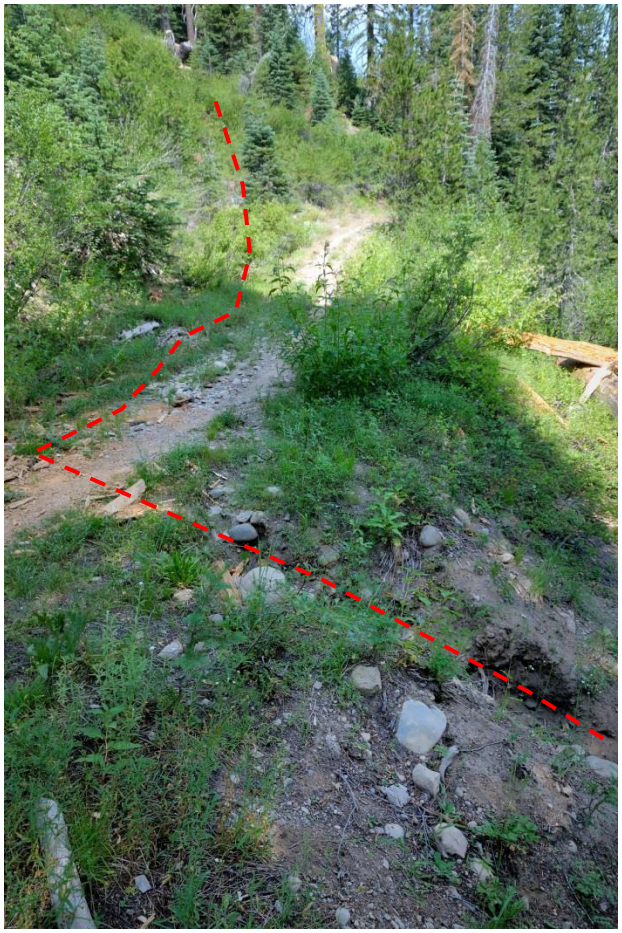
View: Downslope Steep eroded slope beneath trail

View: Downslope This section of the trail is crossed by a wide area of natural slope erosion through a break in the forest on a steep grade.

View: Downslope going down to the trail. Erosion on bare slope above trail is evident.

Erosion Point 16

Drainage: Lake Dulzura



View: North along trail. Trail at this point is relatively steep and requires a mountain bike to brake. The tread of the trail is single track and deteriorated.

View: Upslope The natural drainage is steep on the upslope side and water drainage follows the trail for 50-60 ft. The trail will require drainage remediation and grade modifications to minimize erosion effects.

View: Downslope The tread is erosion resistant but the downslope erosion is significant. Drainage modifications will be required.

Erosion Point 17

Drainage: Lake Dulzura

View: North along trail. Reindeer trail at this point is flat and the tread shows normal wear. It is cut by natural shallow drainage. The trail has two treads in good shape and straight sightlines.

View: Upslope. The slope is relatively shallow and shows signs of natural drainage.

View: Downslope.

Erosion Point 18

Drainage: Lake Dulzura

View: North along trail. Reindeer trail at this point rises at a shallow slope and has a sweeping turn. The soil is loose when it dries out in July and does show erosion affects.

View: Downslop An existing drainage ditch does route the drainage below the trail.

View: Upslope. The trail does partially follow the drainage line and drainage remediation is probably necessary. It is possible for mountain bikes to get speed up here so some grade modifications could be made to slow traffic.

Erosion Point 19

Drainage: Lake Dulzura

View: South along trail. This is Reindeer trail on the east side of Serene Lakes. This particular section is right in the drainage line and the tread has been washed away leaving the underlying rocks. Drainage modifications would be necessary to remediate this section.

Erosion Point 20

Drainage: Lake Dulzura

View: South along Reindeer to intersection. This is the intersection of the Reindeer and Jack's Jump trails on the east side. Jack's Jump trail follows the drainage line down all the way from Razor Back ridge. There is some erosion where it intersects with Reindeer which effectively continues the drainage. Drainage remediation of both trails has been attempted in the past and more work will be necessary.

Erosion Point 21

Drainage: Lake Dulzura

View: South along Reindeer trail.

View: South along Reindeer trail.

This erosion point is at the intersection of the Reindeer trail and a primary inflow drainage creek into Lake Dulzura. The creek is washed down to the underlying rock where the trail crosses. Drainage on the trail could be remediated to form a better trail interface with the creek. The trail is flat and the tread is loose but does show some resistance to erosion.

View: North along Reindeer/Switchback trail.

Erosion Point 22

Drainage: Lake Dulzura

View: Looking east at intersection. This is a major trail intersection between the Reindeer, Switchback, Claim Jumper and Overload trails. The same seasonal drainage creek that runs through Point 21 runs here. The treads for each trail are in good shape, but do show drainage erosion where they dip into the creek.

View: Looking north at intersection. The creek cuts deeply through the intersection of the trails. A bridge would help both hikers and bikers.