



MOTT CANYON (NV-1) EROSION ASSESSMENT



Prepared by

Kevin Drake, CPESC

Integrated Environmental Restoration Services, Inc.

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P.O. BOX 7559 • 2780 LAKE FOREST ROAD • TAHOE CITY, CA 96145

OFFICE: 530.581.IERS (4377) • FAX: 530.581.0359

CA Contractor #762506 • NV Contractor #47205A

www.IERStahoe.com

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BACKGROUND

This erosion assessment implements the effective soil cover monitoring requirement of the Master Plan Amendment 2007 (MPA 07) mitigation measure 7.5-2. Mitigation measure 7.5.2 details the on-going Environmental Monitoring Program that was originally developed and implemented by the Forest Service as part of the Master Plan 1996 EIR/EIS/EIS. The Environmental Monitoring Program was subsequently updated and included in the MPA 07 and is now jointly overseen by the Tahoe Regional Planning Agency (TRPA), USDA Forest Service, and California Water Quality Control Board – Lahontan Region (Lahontan).

The effective soil cover monitoring protocols outlined in the ongoing Environmental Monitoring Program did not prove to be robust enough in past years. As a result, the erosion-focused rapid assessment methodology (described below) began to replace previous protocols in 2013 in an effort to develop a more prioritized framework for addressing watershed erosion issues. This assessment in the NV-1 watershed builds on erosion assessment work that began in the Heavenly Valley Creek watershed (CA-1) in 2013.

ASSESSMENT OVERVIEW

The Mott Canyon (NV-1 watershed) erosion assessment was conducted on June 24-25, 2014. The assessment utilized the erosion-focused rapid assessment (EfRA) process described in the *Watershed Management Guidebook* (Drake et al. 2012 - http://www.ierstahoe.com/pdf/research/watershed_management_guidebook.pdf). The EfRA methodology focuses on identifying the primary sources of erosion (“hot spots”) through a simple GIS flow accumulation mapping exercise followed by on-the-ground assessment. The field assessment work focused on areas where new bike trails are proposed as part of the Heavenly Epic Discovery project, with the intention of identifying areas where proposed disturbance and existing erosion “hot spots” may intersect. The EfRA approach is based on developing an understanding of water flow patterns in the watershed to address the root cause(s) of erosion issues (often a failed water bar or other concentrated drainage features) rather than using modeling and extrapolation to make statements about the theorized condition of the entire watershed. The output of the EfRA process is a matrix of field-assessed hot spots with qualitative ranking criteria, associated maps and photos. This information can be used to prioritize erosion hot spots for treatment within a watershed context. That is, hot spots with high erosion potential (or actual observed erosion) and high hydrologic connectivity to surface waters are generally ranked as higher priorities and hot spots with lower erosion potential and/or connectivity to surface water are ranked as lower priorities.

EROSION HOT SPOT RANKING CRITERIA AND SUMMARY MATRIX

- **Erosion Risk (high/medium/low – H/M/L):** combination of soil and site factors that directly influence erosion potential such as soil density/compaction, slope angle (steepness), total surface cover, and presence of flow concentration features (e.g. gully, water bar).
- **Active Erosion (Y/N):** visual evidence of erosion observed.
- **Active Deposition (Y/N):** visual evidence of sediment deposition observed.
- **Proximity to Stream/SEZ (H/M/L):** distance from hot spot to nearest ephemeral drainage, stream or SEZ (as the crow flies). Categories are: L = >500ft, M = 100-500ft, H = <100ft
- **Connectivity to Stream/SEZ (H/M/L):** likelihood of runoff and sediment from hot spot being transported to a drainage, stream or SEZ. Assessing connectivity requires basic understanding of hydrologic processes and a keen eye in the field, yet can be somewhat subjective. In general, high connectivity is characterized by a well-defined drainage path with minimal potential for storage or infiltration (e.g. a relatively steep

gully/ditch). Low connectivity is generally characterized as having broad topographic definition and little to no evidence of recent concentrated flow.

- **Overall Priority (H/M/L):** This is a synthesis of the five criteria above and provides a relative priority for treating hot spots. The most important factors considered here are the magnitude of the erosion source and the likelihood of sediment reaching primary drainages within the NV-1 watershed. Any erosion hot spots within the alignment of proposed bike trails automatically received a high priority (H) ranking.

Table 1. Erosion Hot Spot Summary Matrix (NV-1 Watershed)

Hot Spot #	Feature Type	Hot Spot-Proposed Trail Interaction	Erosion Risk	Active Erosion	Active Depos.	Prox to stream or SEZ	Connect. to stream or SEZ	Overall Priority	Problem Description, Notes	Mitigation Recommendations
1	water bar	Y	L	Y	Y	L	M	H	trail crosses old low-gradient water bar	remove/decommission water bar using soil restoration treatment
2	water bar	N	H	Y	Y	L	M	M	water bar overtopped (WB #4 on Orion's); heavy rilling below	rebuild water bars and create infiltration capacity on the upslope side through soil restoration treatment; rake out rills downslope; construct mulch berms or infiltration strips on ski run to prevent further erosion by slowing/disbursing flow
3	rill/gully	Y	M	Y	Y	L	M	H	rilling through depositional area below steep rocky slope where proposed beginner trail crosses	restoration treatment to stabilize rilling area below rocks
4	rill/gully	Y	H	Y	Y	L	M	H	several rills and a big gully down Aries ski run; both beg and adv trails are proposed to cross erosion paths on ski run	address source of runoff (see HS#5); stabilize ski run with full restoration treatment and/or series of infiltration strips or mulch berms
5	ski run/road	Y	M	Y	Y	L	M	H	compacted ski run/old road below Comet lift top terminal sheds water onto Aries ski run, contributing to ski run erosion issues (linked to HS #4)	create infiltration/spreading area at top of Aries ski run (before ski run steepens)
6	rill/gully	Y	M	Y	Y	L	M	H	~4 distinct large rills on ski run at proposed trail crossing	soil restoration treatment to stabilize rilling area below rocks
7	water bar	Y	H	Y	Y	L	M	H	proposed trail crossing at water bar with erosion, which collects runoff from at least 150ft of dirt road	design stable drainage crossing for trail
8	proposed trail	Y	L	N	N	L	H	H	proposed trail switchback very near dipper drainage; lots of bare soil but no visible erosion	shift trail alignment so it doesn't drain to dipper drainage

Hot Spot #	Feature Type	Hot Spot-Proposed Trail Interaction	Erosion Risk	Active Erosion	Active Depos.	Prox to stream or SEZ	Connect. to stream or SEZ	Overall Priority	Problem Description, Notes	Mitigation Recommendations
9	water bar	Y	M	Y	Y	L	M	H	proposed trail switchback at end of water bar (major depositional area)	shift trail alignment away from water bar depositional area
10	proposed trail	Y	M	Y	Y	L	H	H	proposed trail switchback very near dipper drainage with a few rills just upslope of proposed trail and connecting to dipper drainage	shift trail alignment away from dipper drainage and existing rills
11	water bar	Y	M	Y	Y	L	L	H	proposed trail switchback near water bar outlet with visible rilling	shift trail alignment away from water bar drainage area
12	road	N	L	N	N	L	M	L	old road - mitigation opportunity	decommission old road
13	proposed trail	Y	L	N	N	L	H	H	proposed trail switchback close to dipper drainage and in area with heavy Manzanita understory	shift trail alignment away from dipper drainage and out of heavily-vegetated area
14	water bar	N	H	Y	Y	L	H	M	several blown out water bars on Big Dipper ski run; mitigation opportunity - not in proposed trail alignment	rebuild water bars and create infiltration capacity on the upslope sides through soil restoration treatment; rake out rills downslope; construct mulch berms or infiltration strips on ski run to prevent further erosion by slowing/disbursing flow
15	depositional area	N	H	Y	Y	L	M	M	depositional area at lower end of dipper drainage	address erosion through source control upslope
16	drainage	Y	M	Y	Y	L	M	H	proposed trail alignment crosses defined drainage	shift proposed trail alignment (location of switchback) to avoid crossing drainage
17	road	N	M	Y	Y	L	M	L	old road to avalanche gun - mitigation opportunity	decommission old road (~8 ft avg width x 1290 ft length; northernmost 100 ft is ~20 ft width)
18	road	N	L	N	N	L	L	L	short loop/turnaround road - mitigation opportunity	decommission turnaround section of road (~12ft x 100ft)

Hot Spot #	Feature Type	Hot Spot-Proposed Trail Interaction	Erosion Risk	Active Erosion	Active Depos.	Prox to stream or SEZ	Connect. to stream or SEZ	Overall Priority	Problem Description, Notes	Mitigation Recommendations
19	road-drainage crossing	N	H	Y	Y	M	M	M	lower end of dipper drainage crosses summer road; know to carry moderate flow during spring runoff	install mulch berms in channel above and below road; create infiltration/spreading area below road
20	drainage	Y	L	Y	Y	M	L	H	proposed trail alignment crosses defined drainage (created by concentrated runoff from water bars on Orion's ski run upslope)	realign trail to avoid drainage or design stable drainage crossing
21	drainage	Y	M	Y	Y	M	L	H	proposed trail alignment crosses defined drainage (created by concentrated runoff from water bars on Orion's ski run upslope)	realign trail to avoid drainage or design stable drainage crossing
22	drainage	Y	L	Y	Y	M	L	H	proposed trail alignment crosses defined drainage (created by concentrated runoff from water bars on Orion's ski run upslope)	realign trail to avoid drainage or design stable drainage crossing
23	drainage	Y	H	Y	Y	M	L	H	proposed trail alignment crosses defined drainage (created by concentrated runoff from water bars on Orion's ski run upslope)	realign trail to avoid drainage or design stable drainage crossing
24	drainage	Y	M	Y	Y	M	L	H	proposed trail alignment crosses defined drainage (created by concentrated runoff from water bars on Orion's ski run upslope)	realign trail to avoid drainage or design stable drainage crossing

Table 2. Points of Interest (NV-1 Watershed)

ID	Feature Type	Hot Spot-Proposed Trail Interaction	Erosion Risk	Active Erosion	Active Depos.	Prox to stream or SEZ	Connect. to stream or SEZ	Problem Description, Notes	Mitigation Recommendations
1	proposed trail	N	L	N	N	L	M	no concentrated flow in proposed advanced trail alignment; steep rocky depositional area below	no action recommended
2	proposed trail	N	L	N	N	L	M	moderate slope; lots of rocks/logs; no obvious erosion or concentrated surface runoff	no action recommended

ID	Feature Type	Hot Spot-Proposed Trail Interaction	Erosion Risk	Active Erosion	Active Depos.	Prox to stream or SEZ	Connect. to stream or SEZ	Problem Description, Notes	Mitigation Recommendations
3	proposed trail	N	L	N	N	L	L	proposed trail alignment - low erosion risk	no action recommended
4	drainage	N	H	Y	Y	L	H	dipper drainage (legacy impact)	no action recommended

EROSION HOT SPOT PHOTOS

Table 3. Erosion Hot Spot Photo Summary (NV-1 Watershed)

Hot Spot #	Photo 1	Photo 2
1		
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3		

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23		
24		

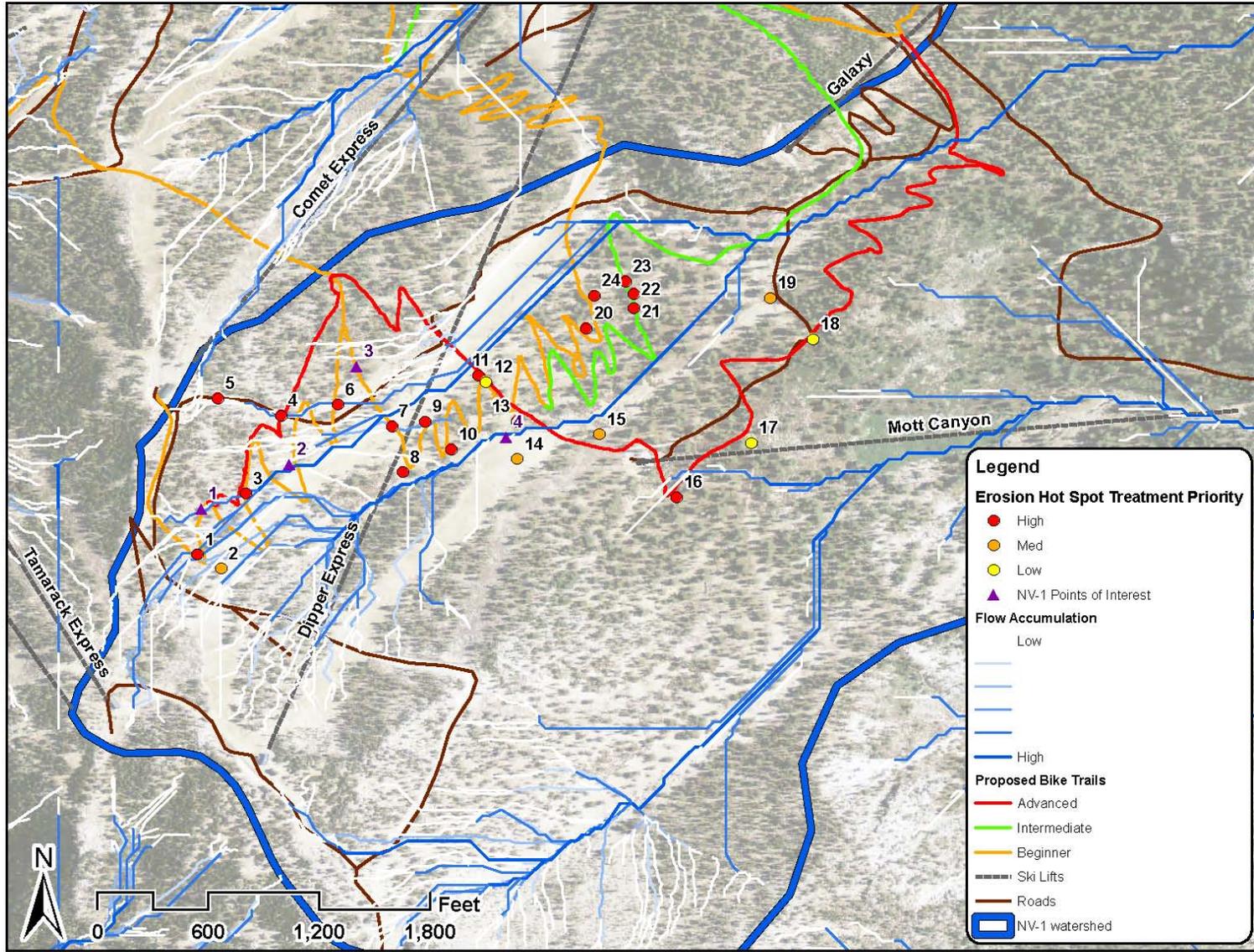
Table 4. Points of Interest Photo Summary (NV-1 Watershed)

ID	Photo 1	Photo 2
1		

<p>2</p>		
<p>3</p>		
<p>4</p>		

EROSION HOT SPOT MAPS

See next page.



Map Prepared by Kevin Drake, IERS, Inc. July 2014. Data Sources: Vail Corp, RCI, IERS, USGS

Figure 1. Efra Summary Map showing hot spots in NV-1 watershed, zoomed in to hot spot locations.

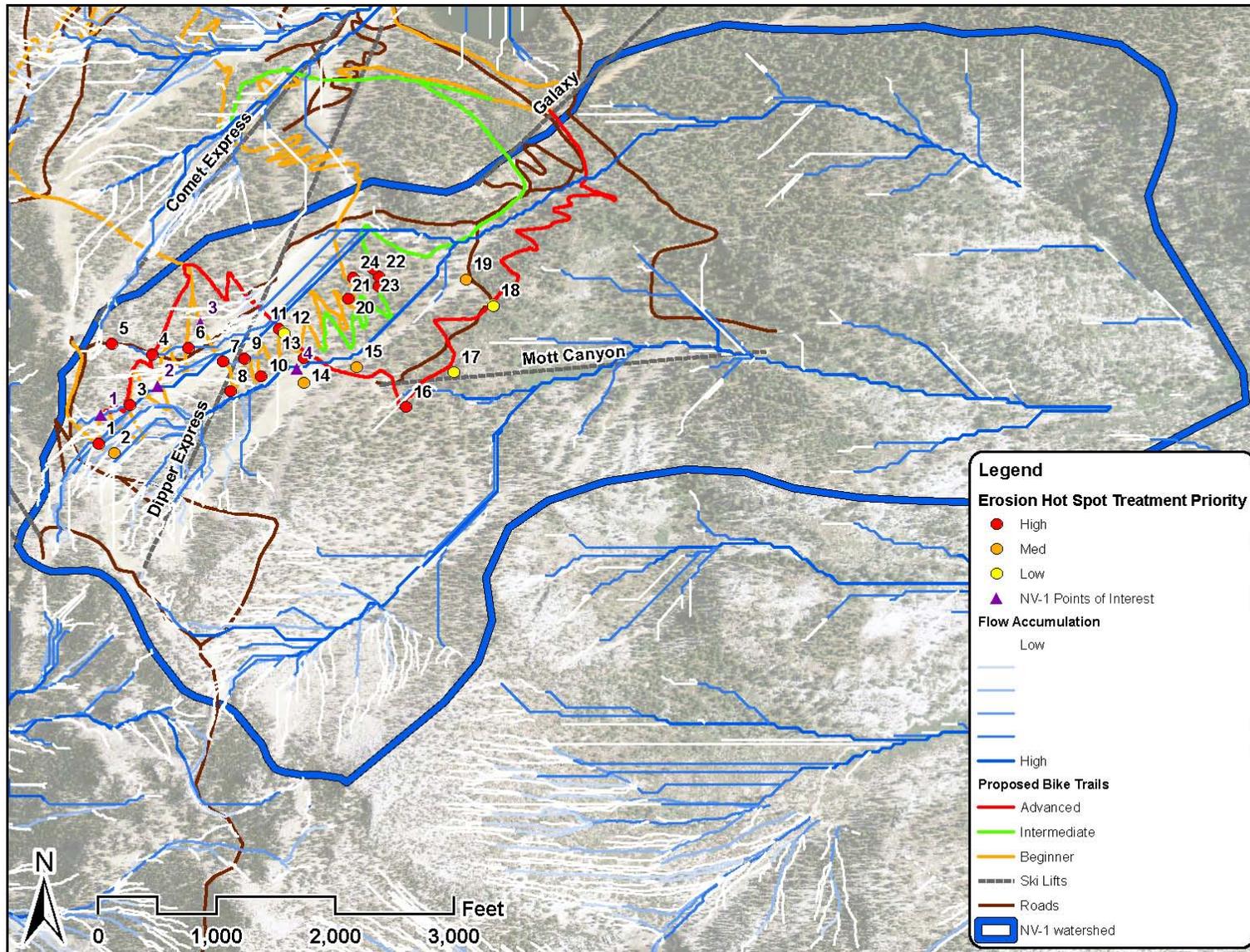


Figure 2. Efra Summary Map showing hot spots in Mott Canyon (NV-1), zoomed out to show entire NV-1 watershed.

LITERATURE CITED

Drake, K. and M. Hogan. 2012. Watershed Management Guidebook: An Outcome-Based Guide to Watershed Management. Prepared for the California State Water Resources Control Board. Available online at: http://www.ierstahoe.com/pdf/research/watershed_management_guidebook.pdf