

An aerial photograph of a wide, light-colored river meandering through a deep mountain valley. The surrounding hillsides are covered in dense forests with trees displaying vibrant autumn colors of yellow, orange, and green. A long, multi-span bridge crosses the river in the lower-left foreground, with a single car visible on it. The river continues to wind through the valley towards the background, where more mountains are visible under a cloudy sky.

USMP Rating Form - Preliminary Rating

6/23/2017

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USMP Rating Form - Preliminary Rating

Down to Business

SITE INFORMATION									
ITALICIZED DATA CATEGORIES REQUIRED FOR FULL RATING									
Management Area						Date			
Hazard Type	Rockfall Planar Wedge Topple Ravelling Rock Avalanche Indeterminate Rock Failures Differential Erosion					Landslide Above, Below, or Across Route Translational Rotational Debris Flow Shallow slump Erosional Failure			
Road/Trail No.	<input type="radio"/> Trail <input type="radio"/> Road	Road/Trail Class				Rater			
Beginning Mile Marker		Ending Marker		Side		Weather			
Begin Coord.	Lat. Long.	End Coord.	Lat. Long.	Datum		AADT			
Length of Affected Road/Trail (ft)		Slope Height (rock) / Axial Length (slide) (ft)				Slope Angle (°)			
Sight Distance (ft)		Roadway/Trail Width (ft)				Speed Limit (mph)			
Ditch Width (ft)	RANGE	Ditch Depth (ft)	RANGE	Ditch Slope (H:V)		RANGE	Blk Size (ft)/Volume (cy)		
Annual Rainfall (in)	RANGE	Sole Access Route <input type="checkbox"/> Yes <input type="checkbox"/> No		Fixes Present <input type="checkbox"/> Yes <input type="checkbox"/> No		Photo # Range			
Comments									

PRELIMINARY RATING					
Category Rating	3	9	27	81	Score
A. Landslide – Roadway Width Affected	0-5 Percent	6-25 Percent	26-50 Percent	51-100 Percent	
B. Landslide – Slide/Erosion Effects	Visible crack or slight deposit of material / minor erosion	1 inch offset, or 6-inch deposit of material / major erosion will affect travel in < 5 yrs	2-inch offset or 12-inch deposit/ mod. erosion impacting travel annually	4-inch offset or 24-inch deposit/ severe erosion impacting travel consistently	
C. Landslide – Roadway Length Affected	25 ft	100 ft	225 ft	400 ft	CALC
D. Rockfall – Ditch Effectiveness (consider launch features)	Good	Moderate	Limited	No Catchment	
E. Rockfall – Rockfall History	Few Falls	Occasional Falls	Many Falls	Constant Falls	
F. Rockfall – Block Size or Volume per Event	1 ft or 3 yd ³	2 ft or 6 yd ³	3 ft or 9 yd ³	4 ft or 12 yd ³	CALC
G. All - Impact on Use	Full use continues with minor delay	Partial use remains Use modification required, short (3 mi/30 min.) detour available	Use is blocked – long (>30 min) detour available or less than 1 day closure	Use is blocked – no detour available or closure longer than 1 week	
H. All - AADT / Usage / Economic or Recreational Importance (highest rating applies)	50 Rarely Used Insignificant economic / rec. importance	200 Occasionally used Minor economic / rec. importance	450 Frequently used Moderate economic / rec. importance	800 Constantly used Significant economic / rec. importance	CALC FOR AADT ONLY
LANDSLIDES TOTAL (A+B+C+G+H)					CALC
ROCKFALL TOTAL (D+E+F+G+H)					CALC
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SLOPE HAZARD RATING									
Category Rating		3	9	27	81	Score			
I. All - Slope Drainage		Slope appears dry or well drained; surface runoff well controlled	Intermittent water on slope; mod. well drained; or surface runoff moderately controlled	Water usually on slope; poorly drained; or surface runoff poorly controlled	Water always on slope; very poorly drained; or surface water runoff control not present				
J. All - Annual Rainfall		0-10"	10-30"	30-60"	60"+				
K. All - Slope Height / Axial length of slide		25 ft	50 ft	75 ft	100 ft	CALC			
Select One Unstable Slope Type Landslides/ Erosion (add A, B, C) Rockfalls (add D, E, F) Geologic Character Case 1 Case 2	L. Thaw Stability (Cold Climates)	Unfrozen/Thaw Stable	Slightly Thaw Unstable	Moderately Thaw Unstable	Highly Thaw Unstable				
	M. Instability-Related Maint. Frequency	Every 10 years	Every 5 years	Every 2 years	Every year				
	N. Movement History	Minor movement or sporadic creep	Up to 1 inch annually or steady annual creep	Up to 3 inches per event, one event per year	>3" per event, >6" annually, more than 1 event per year (includes all debris flows)				
	O. Rockfall-Related Maint. Frequency	Normal, scheduled maintenance	Patrols after every storm events	Routine seasonal patrols	Year-round patrols				
	P. Structural Condition	Discontinuous Favorable	Discontinuous Random	Discontinuous Adverse	Continuous Adverse				
	Q. Rock Friction	Rough/ Irregular	Undulating	Planar	Clay infilled/ Slickensided				
	R. Structural Condition	Few differential erosion features	Occasional differential erosion features	Many differential erosion features	Major differential erosion features				
	S. Diff. in Erosion Rates	Small difference	Moderate difference	Large difference	Extreme difference				
	T. LANDSLIDE HAZARD TOTAL (A+B+C+H+J+K+L+M+N)						CALC		
	U. ROCKFALL HAZARD TOTAL (D+E+F+J+K+O+(greatest of P+Q or R+S))						CALC		
RISK RATING									
V. Route Width or Trail Width		36 ft 14 ft	28 ft 10 ft	20 ft 6 ft	12 ft 2 ft	CALC			
W. Human Exposure Factor		12.5% of the time	25% of the time	37.5% of the time	50% of the time	CALC if AADT > 1000			
X. % of Decision Sight Distance (Judge avoidance ability on trails)		Adequate, 100% of low design value	Moderate, 80% of low design value	Limited, 60% of low design value	Very Limited, 40% of low design value	CALC for roads			
Y. Right of Way (R/W) Impacts (If Left Unattended)		No R/W implications	Minor effects beyond R/W	Private property, no structures affected	Structures, roads, RR, utilities, or Parks affected				
Z. Environmental/Cultural Impacts if Left Unattended		None/No Potential to Cause Effects	Likely to Effect/No Hist. Prop. Affected	Likely to adversely Affect/Finding of No Adverse Effect	Current adverse effects/Adverse Effect				
AA. Maintenance Complexity		Routine Effort/In-House	In-house maint./ special project	Specialized equip./ contract	Complex/ dangerous effort /location/contract				
BB. Event Cost		\$0-2k	\$2-25k	\$25-100k	>\$100k				
CC. RISK TOTALS: (G+H+V+W+X+Y+Z+AA+BB)						CALC			
TOTAL USMP SCORE: LANDSLIDES (T+CC) OR ROCKFALL (U+CC)						CALC			

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6/23/2011

Slope Types

- Hazard Criteria for Landslides
 - Focuses on impacts to road/trail
- Hazard Criteria for Rockfall
 - Focuses on size and frequency of rockfall and the ability to keep debris from the road/trail
- Risk (both slope types)
 - What are the consequences of failure and how 'important' is the road/trail
- Note the letter designation (A, B, C, etc.) for each Category

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Ratings

- Ratings are exponential
 - 3, 9, 27, 81
 - Minimum 1, Maximum 100.

$$score = 3^x$$

- Some categories are based on judgement and approximations
- Others are based on calculations from site information data
 - Calculations are based on determination of “x” in the exponential formula

- Example: $x = \sqrt{\frac{AADT}{50}}$

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A. LS – Roadway Width Affected

3 points 0-5 percent The travel lanes are generally not affected by the landslide feature, but the available paved surface is reduced. Trails typically are only slightly affected.

9 points 6-25 percent Events affect up to 25% of the travel lanes. Adequate paved surface is available to maneuver around the event. A visual cue for tripping hazards may be needed on trails.

27 points 26-50 percent Events affect up to half of the surface dedicated to travel lanes. A visual cue for tripping hazards may be needed on trails and maintenance may be considered.

81 points 51-100 percent Events affect more than half of the road with limited paved surface available to maneuver around the event. Trails may be closed and maintenance may be required to keep the trail open.

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A photograph of a two-lane asphalt road with a yellow double line on the left. The road is wet and shows signs of a landslide on the right shoulder. A large, light-colored, mossy or silty mass has slid down the embankment, partially covering the road surface. In the background, two vehicles are visible on the road. The surrounding area is forested with green trees and vegetation.

A. LS – Roadway Width Affected

- 3 pts: 0- 5%



A. LS – Roadway Width Affected

- 9 pts: 5 – 25%



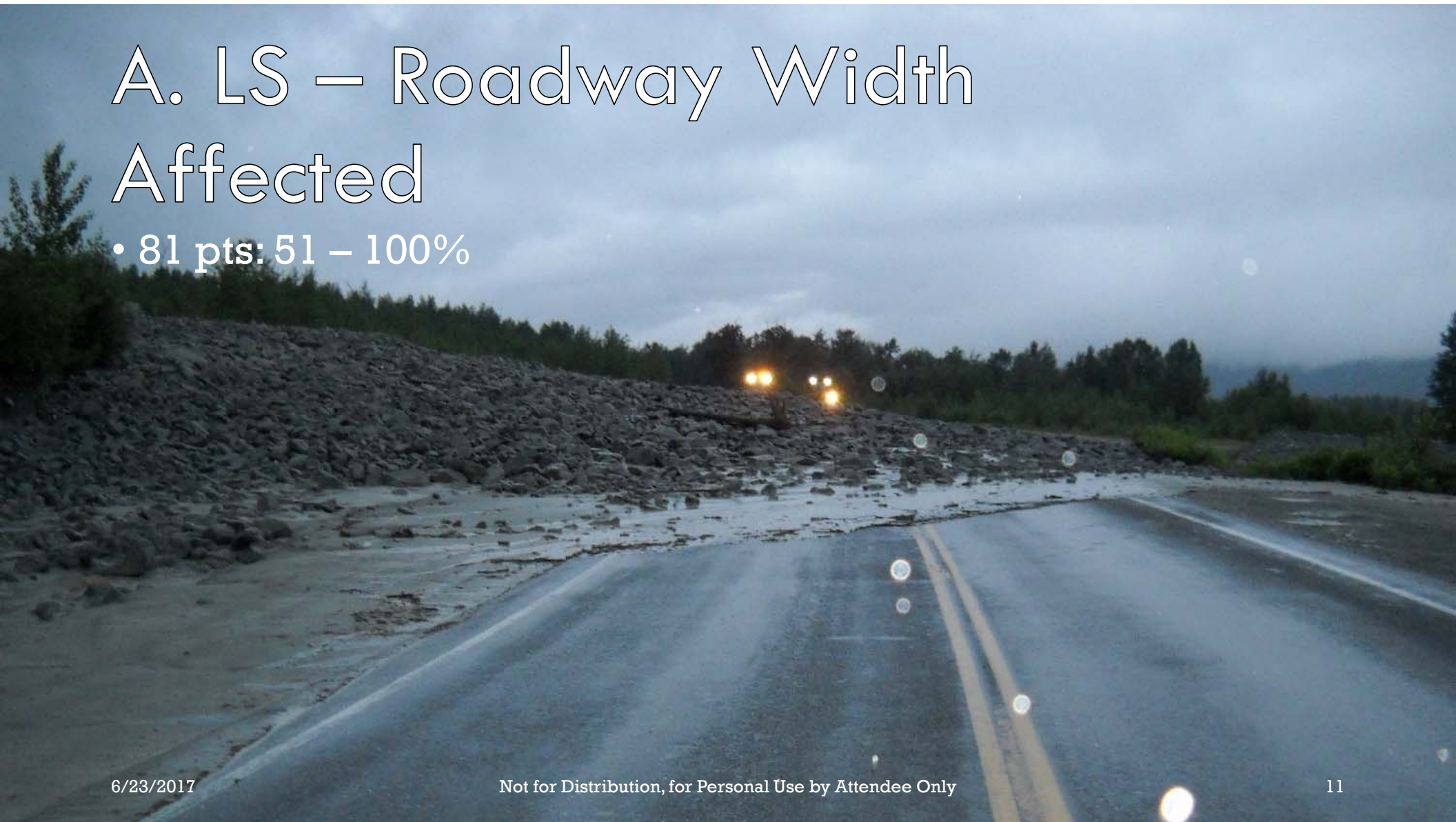
A. LS – Roadway Width Affected

- 81 pts: 51 – 100%

2014/07/22 13:08

A. LS – Roadway Width Affected

- 81 pts: 51 – 100%



B. LS – Slide/Erosion Effects

3 points Visible crack or slight deposit of material on road/minor erosion. Slight pavement cracking or heaving, or a thin deposit of slide debris has occurred but they are small enough not to disturb traffic flow or require evasive maneuvers.

9 points 1 inch offset, or 6-inch deposit of material on road/major erosion will affect travel in <5 years. A noticeable drop or heave in the pavement or a deposit of slide debris has occurred that requires lower speeds to traverse.

27 points 2-inch offset or 12-inch deposit of material on road/moderate erosion impacting travel annually. A large drop or heave in the pavement or a deposit of slide debris has occurred that requires significantly lower speeds to traverse and may elicit unsafe driver reactions.

81 points 4-inch offset or 24-inch deposit of material on road/severe erosion impacting traffic consistently. A major drop or heave in the pavement or deposit of slide debris has occurred that cannot be traversed. Unsafe driver reactions are likely and immediate maintenance attention is required to reestablish safe traffic flow.

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C. Landslide – Roadway Length Affected	25 ft	100 ft	225 ft	400 ft	CALC
D. Rockfall – Ditch Effectiveness (consider launch features)	Good	Moderate	Limited	No Catchment	
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For trails, the slower driving speed indicated in the table may be reflected in increased tripping hazards rather than lower speed limits.

B. LS – Slide/Erosion Effects

- 3 pts: *Visible crack or slight deposit of material on road/minor erosion*

2014/09/29



B. LS – Slide/Erosion Effects

- 9 pts: *1 inch offset, or 6-inch deposit of material on road/major erosion will affect travel in <5 years*

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- 9 pts: *1 inch offset, or 6-inch deposit of material on road/major erosion will affect travel in <5 years*

2014/09/23



B. LS – Slide/Erosion Effects

- 81 pts: *4-inch offset or 24-inch deposit of material on road/severe erosion impacting traffic consistently*

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C. LS – Roadway Length Affected

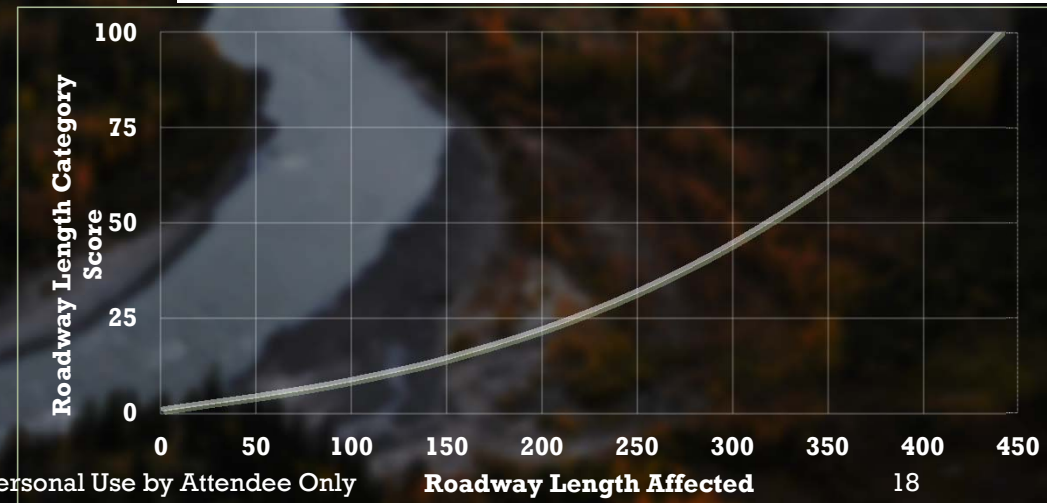
- Length recorded in Site Information
- Calculated

3 points	25 feet
9 points	100 feet
27 points	225 feet
81 points	400 feet

$Score = 3^x$ (max 100);

$$x = \sqrt{\frac{\text{length of roadway affected}}{25 \text{ (feet)}}}$$

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C. LS – Roadway Length Affected

$$\text{Score} = 3^x (\text{max } 100);$$

$$x = \sqrt{\frac{\text{length of roadway affected}}{25 \text{ (feet)}}}$$

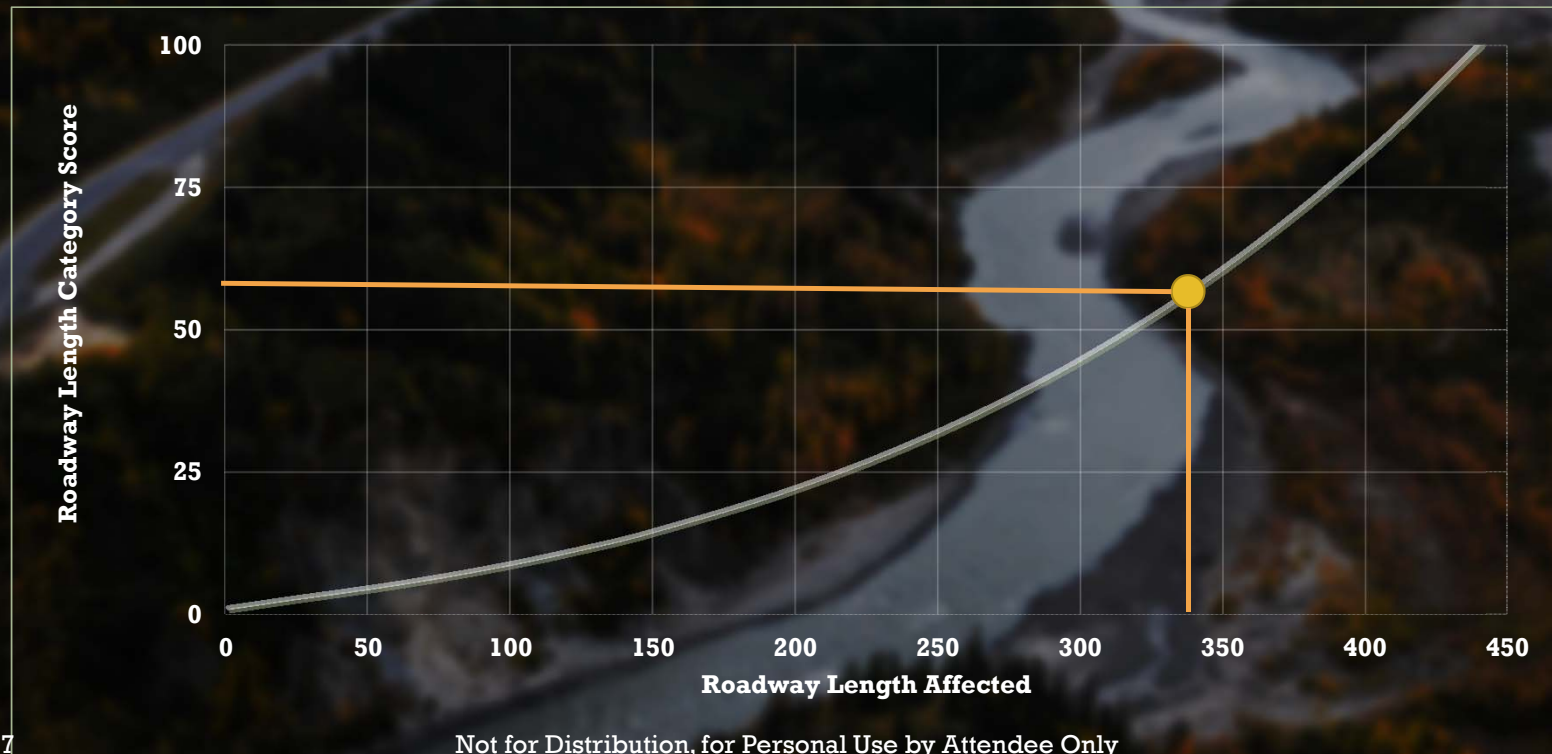
Example:

**Slide is measured at 339' along the side of the road.
What is the score?**

$$x = \sqrt{\frac{339}{25}}; x = \sqrt{13.56}; x = 3.68$$
$$\text{score} = 3^{3.68} = 57 \text{ pts}$$

C. LS – Roadway Length Affected

$$\text{score} = 3^{3.68} = 57 \text{ pts}$$



D. RF – Ditch Effectiveness

- Based on judgement, history, and site observations
 - Slope height and angle
 - Ditch width, depth, and shape
 - Anticipated volume
 - Launch features

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6/25/2017



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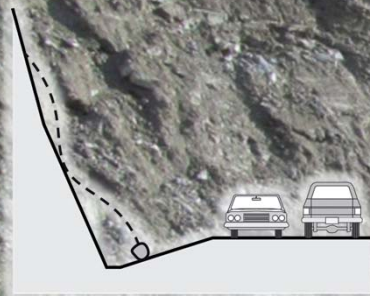
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D. RF – Ditch Effectiveness

- 3 points** Good Catchment. All or nearly all falling rocks are retained in the catch ditch.
- 9 points** Moderate Catchment. Falling rocks occasionally reach the roadway.
- 27 points** Limited Catchment. Falling rocks frequently reach the roadway.
- 81 points** No Catchment. No ditch, or ditch is totally ineffective. All or nearly all falling rocks reach the road.

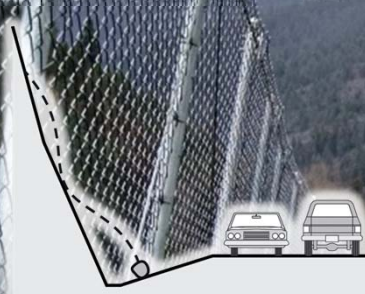


D. RF – Ditch Effectiveness



Good Ditch Effectiveness

D. RF – Ditch Effectiveness



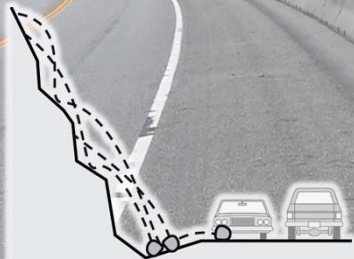
Good Ditch Effectiveness

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D. RF – Ditch Effectiveness



Moderate Ditch Effectiveness

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D. RF – Ditch Effectiveness



D. RF – Ditch Effectiveness



Limited Ditch Effectiveness

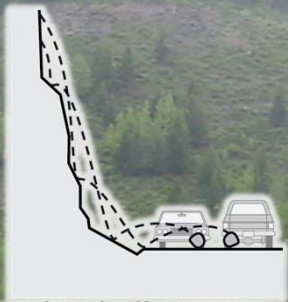


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D. RF – Ditch Effectiveness



Limited Ditch Effectiveness

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D. RF – Ditch Effectiveness



2014/07/24

6/23/2017

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D. RF – Ditch Effectiveness



6/23/2017



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D. RF – Ditch Effectiveness



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E. RF – Rockfall History

- Based on judgement, history, and site observations

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D. Rockfall – Ditch Effectiveness (consider launch features)	Good	Moderate	Limited	No Catchment	
E. Rockfall – Rockfall History	Few Falls	Occasional Falls	Many Falls	Constant Falls	
F. Rockfall – Block Size or Volume per Event	1 ft or 3 yd ³	2 ft or 6 yd ³	3 ft or 9 yd ³	4 ft or 12 yd ³	CALC
G. All - Impact on Use	Full use continues with minor delay	Partial use remains Use modification required, short (3 mi/30 min.) detour available	Use is blocked – long (>30 min) detour available or less than 1 day closure	Use is blocked – no detour available or closure longer than 1 week	
H. All - AADT / Usage / Economic or Recreational Importance (highest rating applies)	50 Rarely Used Insignificant economic / rec. importance	200 Occasionally used Minor economic / rec. importance	450 Frequently used Moderate economic / rec. importance	800 Constantly used Significant economic / rec. importance	CALC FGR AADT ONLY
LANDSLIDES TOTAL (A+B+C+G+H)					CALC
ROCKFALL TOTAL (D+E+F+G+H)					CALC
Preliminary Rating Good (15-21 pts) Fair (22-161 pts) Poor (>161 pts) Sites rated as Fair or Poor receive detailed evaluation (complete back page)					

3 points Few Falls. Rockfalls occur only a few times a year (or less), or only during severe storms. This category is also used if no rockfall history data is available and evidence of rockfall is absent.

9 points Occasional Falls. Rockfall occurs regularly. Rockfall can be expected several times per year and during most storms.

27 points Many Falls. Typically, rockfall occurs frequently during a certain season, such as the winter or spring wet period, or the winter freeze/thaw, etc. This category is for sites where frequent rockfalls occur during a certain season but are not a significant problem during the rest of the year. This category may also be used where severe rockfall events have occurred.

81 points Constant Falls. Rockfalls occur frequently throughout the year. This category is also for sites where severe rockfall events are common.

E. RF – Rockfall History

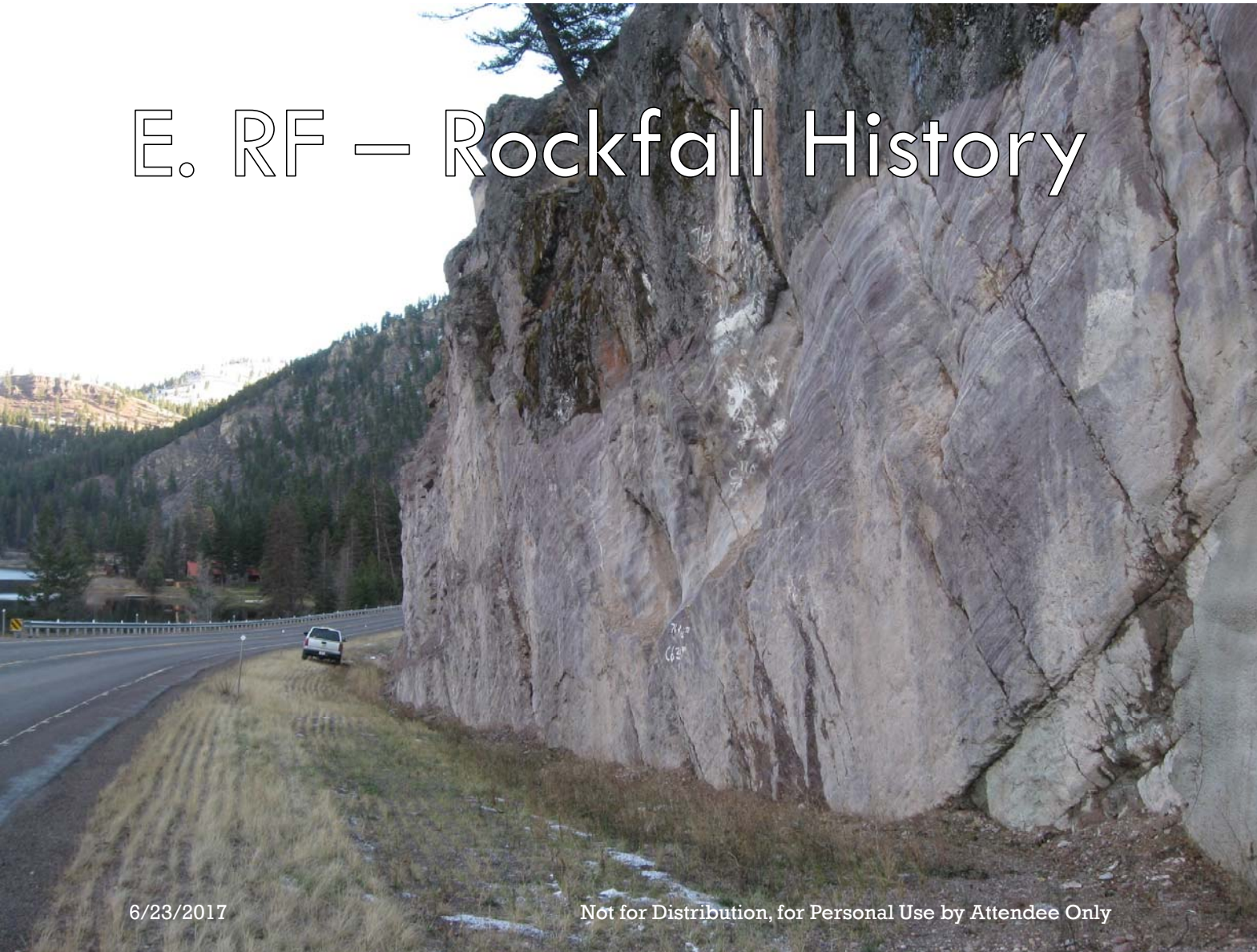
Few Falls: Maintenance reported no rockfall activity through this section, despite the overhanging block and apparent rockfall problem.

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E. RF – Rockfall History



Few Falls: New cut appears stable and appears to remain so for the long term. No ditch cleaning (only mowing) had occurred for the two years since construction... no rocks.

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E. RF – Rockfall History



Occasional Falls: Ditch is relatively narrow, has rocks in the ditch, and an unstable overburden layer at its crest. If Maint. indicates 'Few' rockfalls, reasonable to escalate it to 'Occasional' (qualitative terms and sections with high rockfall activity may have a different bias than others).

E. RF — Rockfall History

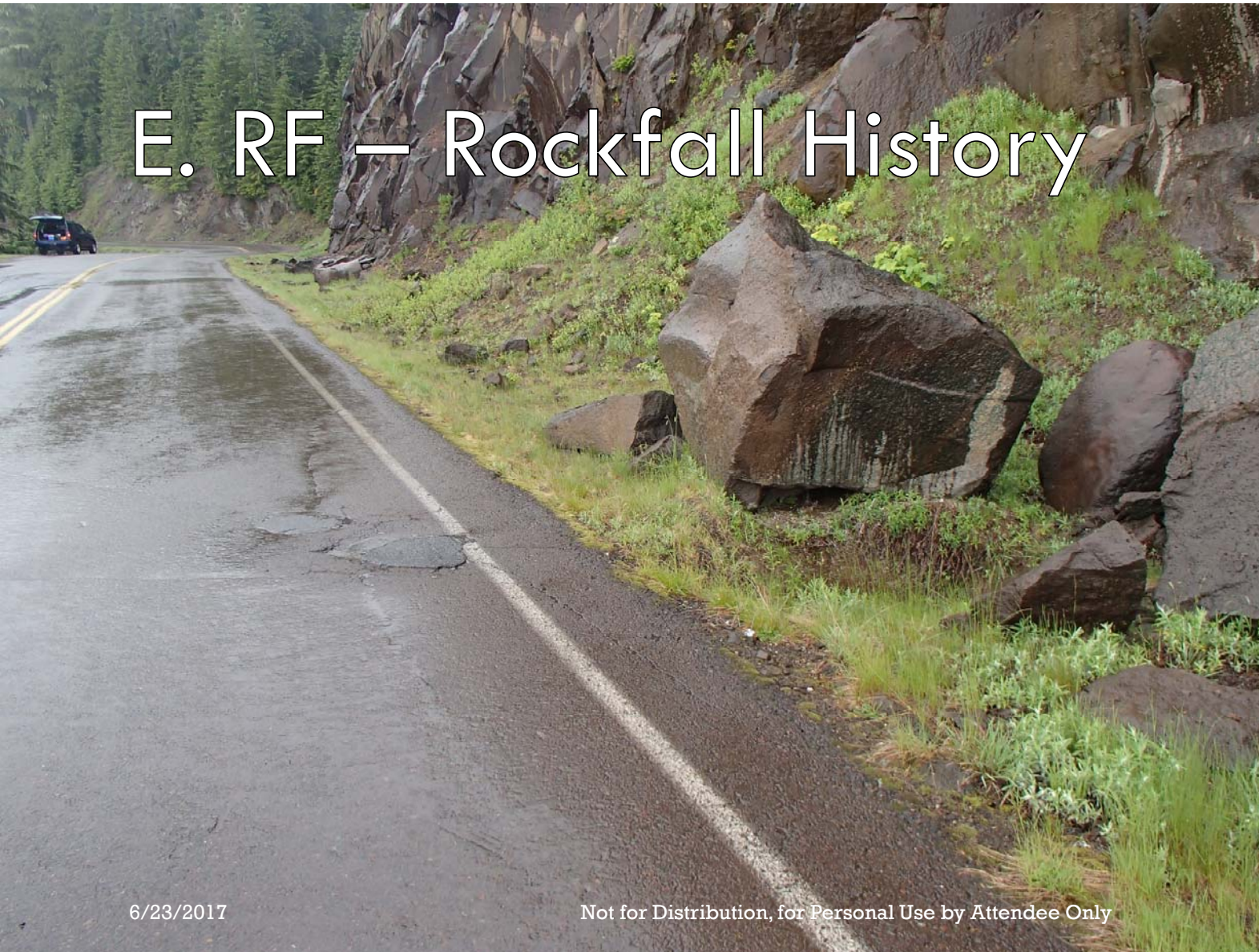
Occasional Falls: Barrier has improved situation, but lack of maintenance likely results in occasional rockfall on the road .

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E. RF – Rockfall History



Occasional Falls: Maint. indicates occasional failures, evidenced by pavement damage

E. RF – Rockfall History

The background image shows a steep, rocky talus slope on the left side of a paved road. The slope is covered in loose rocks and some sparse vegetation. The road curves to the right. The sky is blue with scattered white clouds. The text 'E. RF – Rockfall History' is overlaid on the upper left portion of the image.

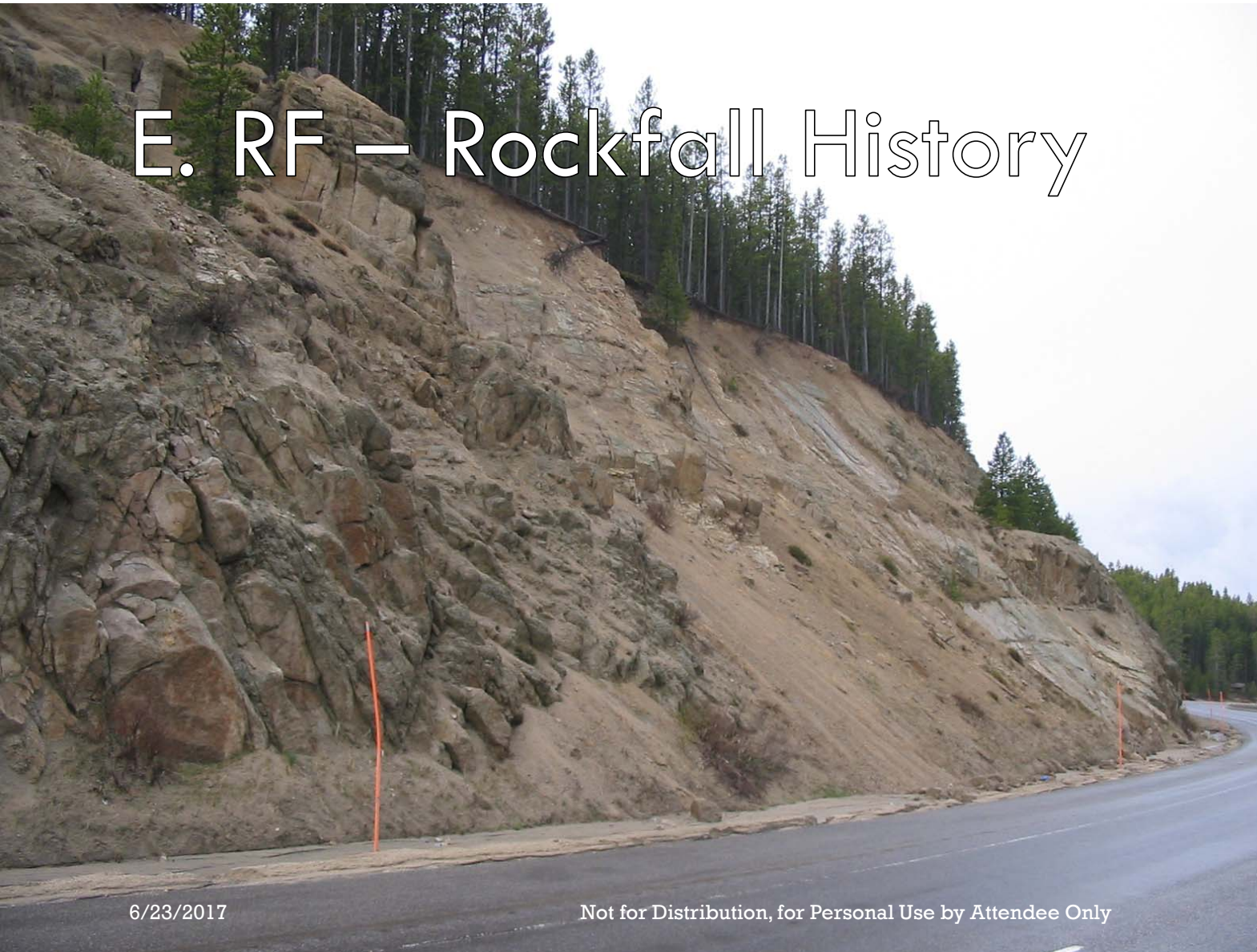
Many Falls: Steep slope in talus leads to regular rockfall, possibly year-round

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E. RF – Rockfall History



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Many Falls: Wet weather regularly leads to rock on the road



E. RF – Rockfall History

Constant Falls: No ditch and active slope leads to constant rocks on the road

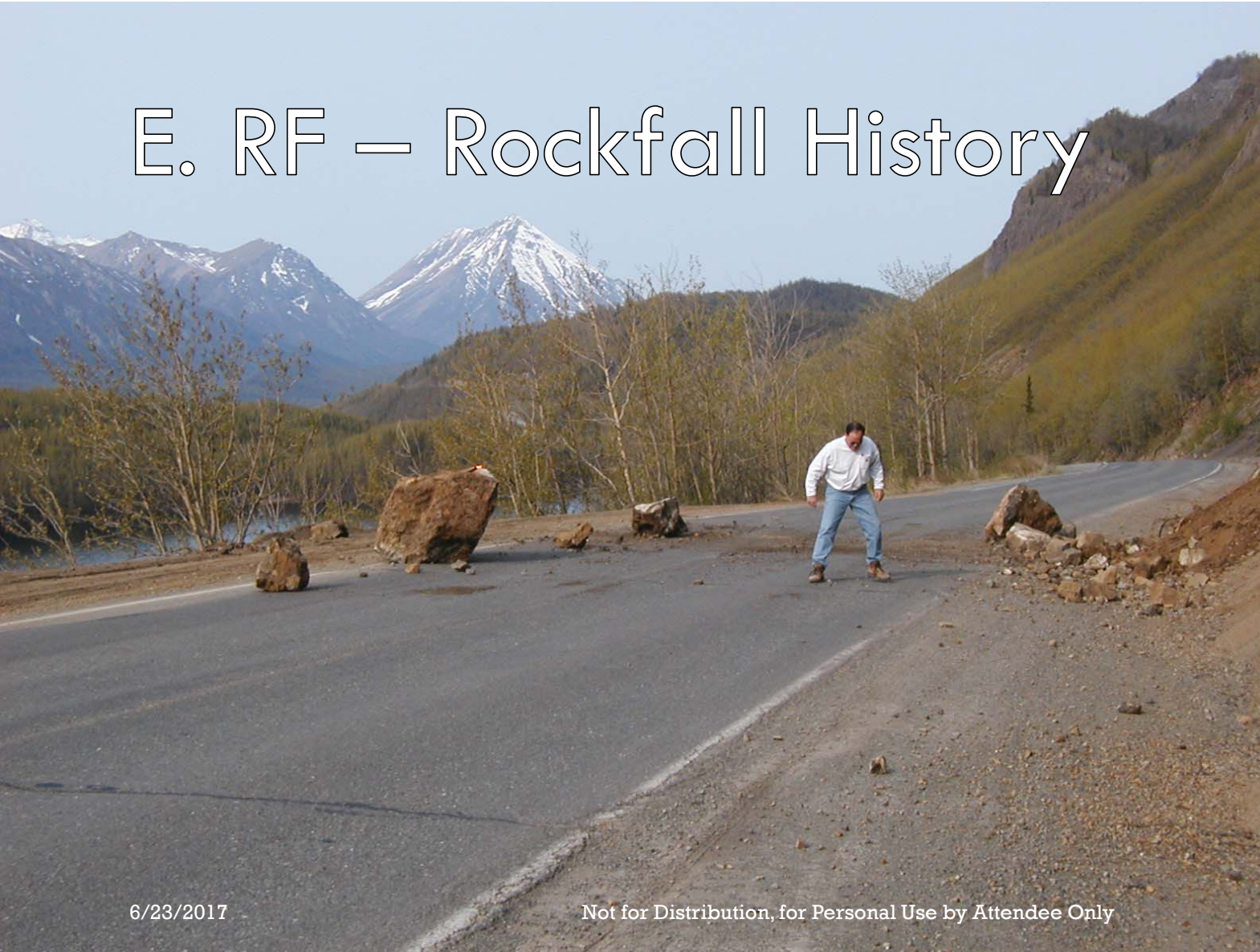
2014/07/24

E. RF – Rockfall History

Constant Falls:
Pockmarks on the
pavement indicates
active & constant rockfall
activity.

2014/07/24

E. RF – Rockfall History



Constant Falls: Maint. patrols and cleans rock off road daily, nearly year round

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E. RF – Block Size or Vol.

- Based on judgement, history, and site observations
- Only one score for category
- Representative of size of rocks in ditch, blocks on the slope, or placed in nearby disposal area
- Be reasonable (nearly all slopes may produce large blocks or volume events)
- Uncertain? Rate both.
- Calculated

PRELIMINARY RATING					
Category Rating	3	9	27	81	Score
A. Landslide – Roadway Width Affected	0-5 Percent	6-25 Percent	26-50 Percent	51-100 Percent	
B. Landslide – Slide/Erosion Effects	Visible crack or slight deposit of material / minor erosion	1 inch offset, or 6-inch deposit of material / major erosion will affect travel in < 5 yrs	2-inch offset or 12-inch deposit/ mod. erosion impacting travel annually	4-inch offset or 24-inch deposit/ severe erosion impacting travel consistently	
C. Landslide – Roadway Length Affected	25 ft	100 ft	225 ft	400 ft	CALC
D. Rockfall – Ditch Effectiveness (consider launch features)	Good	Moderate	Limited	No Catchment	
E. Rockfall – Rockfall History	Few Falls	Occasional Falls	Many Falls	Constant Falls	
F. Rockfall – Block Size or Volume per Event	1 ft or 3 yd ³	2 ft or 6 yd ³	3 ft or 9 yd ³	4 ft or 12 yd ³	CALC
G. All - Impact on Use	Full use continues with minor delay	Partial use remains Use modification required, short (3 mi/30 min.) detour available	Use is blocked – long (>30 min) detour available or less than 1 day closure	Use is blocked – no detour available or closure longer than 1 week	
H. All - AADT / Usage / Economic or Recreational Importance (highest rating applies)	50 Rarely Used Insignificant economic / rec. importance	200 Occasionally used Minor economic / rec. importance	450 Frequently used Moderate economic / rec. importance	800 Constantly used Significant economic / rec. importance	CALC FGR AADT ONLY
LANDSLIDES TOTAL (A+B+C+G+H)					CALC
ROCKFALL TOTAL (D+E+F+G+H)					CALC
Preliminary Rating Good (15-21 pts) Fair (22-161 pts) Poor (>161 pts) Sites rated as Fair or Poor receive detailed evaluation (complete back page)					

	Block Size	Volume Size
3 points	1 foot	3 cy
9 points	2 feet	6 cy
27 points	3 feet	9 cy
81 points	4 feet	12 cy

E. RF – Block Size or Vol.

Score = 3^x (max 100);

Block Size Score = 3^x (max 100); $x = \text{block size (ft)}$

Volume Size Score = 3^x (max 100); $x = \left(\frac{\text{cy}}{3}\right)$

Example:

Slope has produced 10 cy volume events with representatively large rock of 2.5'. What's the score?

Block size score: $x = 3^{2.5 \text{ feet}} = 16 \text{ pts}$

Volume = $3^{\frac{10 \text{ cy}}{3}} = 3^{3.33} = 39 \text{ pts}$

39 > 16 pts

Volume 'wins', category is rated as 39 pts

G. All – Impact on Use

- Based on judgement, history, and site observations
- Take into account *probable* worst case scenario, rockfall history, movement history, & geol. cond.

PRELIMINARY RATING					
Category Rating	3	9	27	81	Score
A. Landslide – Roadway Width Affected	0-5 Percent	6-25 Percent	26-50 Percent	51-100 Percent	
B. Landslide – Slide/Erosion Effects	Visible crack or slight deposit of material / minor erosion	1 inch offset, or 6-inch deposit of material / major erosion will affect travel in < 5 yrs	2-inch offset or 12-inch deposit/ mod. erosion impacting travel annually	4-inch offset or 24-inch deposit/ severe erosion impacting travel consistently	
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LANDSLIDES TOTAL (A+B+C+G+H)					CALC
ROCKFALL TOTAL (D+E+F+G+H)					CALC
Preliminary Rating Good (15-21 pts) Fair (22-161 pts) Poor (>161 pts) Sites rated as Fair or Poor receive detailed evaluation (complete back page)					

3 points	<u>Full use continues with minor delay.</u> A wide shoulder is available for traffic diversion for large slide events; small rockfall events contained in the ditch; nearby detours are available.
9 points	<u>Partial use remains. Use modification required, short (<3mile/30min.) detour available.</u> Traffic control for a lane closure or detour is required for maintenance or clean-up. Detours are less than 3 miles or under 30 minutes in length for up to 1 day.
27 points	<u>Use is blocked – long (>30 min) detour available or closure for 1 day up to 1 week.</u>
81 points	<u>Use is blocked – no detour available or closure longer than 1 week. Major reconstruction efforts with weeks or months closure with no detours are by 100 points.</u>

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H. All - AADT / Usage / Econ. Impact

- Based on judgement, history, and site observations
- Captures road or trail importance, using either judgement or data
- If AADT is available but doesn't capture the importance of the roadway, escalate the score.

PRELIMINARY RATING					
Category Rating	3	9	27	81	Score
A. Landslide – Roadway Width Affected	0-5 Percent	6-25 Percent	26-50 Percent	51-100 Percent	
B. Landslide – Slide/Erosion Effects	Visible crack or slight deposit of material / minor erosion	1 inch offset, or 6-inch deposit of material / major erosion will affect travel in < 5 yrs	2-inch offset or 12-inch deposit/ mod. erosion impacting travel annually	4-inch offset or 24-inch deposit/ severe erosion impacting travel consistently	
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LANDSLIDES TOTAL (A+B+C+G+H)					CALC
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H. All - AADT/Usage/Econ. Impact

	AADT Score *	Qualitative Usage/Economic/Recreational Importance Score*
3 points	50	Rarely used. Insignificant economic and/or recreational importance
9 points	200	Occasionally used. Minor importance.
27 points	450	Frequently used. Moderate importance.
81 points	800	Constantly used. Significant importance.

$$\text{Score} = 3^x (\text{max}100); x = \sqrt{\frac{\text{AADT}}{50}}$$

Example: AADT of 625 veh. per day

$$\text{Score} = 3^x (\text{max}100); x = \sqrt{\frac{625}{50}} = \sqrt{12.5} = 3.53$$


$$\text{Score} = 3^{3.53} = 49 \text{ pts}$$

Example: AADT-based score is 49 pts, but road leads to a boat launch that draws 250,000 visitors annually and drives the local economy. Escalate the score to 81 pts.

Total Preliminary Scores

- For Landslides: add categories A, B, C, G, and H
- For Rockfall, add categories, D, E, F, G, and H
- Categorize rating:
 - Good for 15-21 pts (all 3's to all 3's with one 9)
 - Fair for 22-161 pts (almost all 27's or one maxed out but others low)
 - Poor (all 27's or worse, multiple high scores)
- Progress onto next round of ratings...Detailed Ratings

PRELIMINARY RATING					
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An aerial photograph of a river winding through a valley. The river is light-colored, possibly due to sediment or snow, and contrasts with the darker, forested slopes of the valley. The river meanders from the upper right towards the lower left. The surrounding landscape is rugged with dense vegetation. The sky is visible in the upper right corner, showing some clouds.

Agency can compare these against their minimal acceptable conditions (if any) and Performance Measures they may establish