Stream: HANGING ROCK CRK. Reach: Cross Section: # 1 Date: 10/6/04 Crew: JSF, LET, JTL, MLM

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	1.0	VERY LOW
2.7'	2.7'	1.0		
Root Depth/Bank Height				
* Root Depth (ft) C	C/A		10	EXTREME
0'	0			
Weighted Root Density				
* Root Density (%) D	D*(C/A)		10	EXTREME
0%	0			
Bank Angle				
Bank Angle (degrees)			3.0	LOW
30°				
Surface Protection				
Surface Protection (%)			10	EXTREME
0%				
Materials: LOOSE GRAVEL/SAND			+8	
Stratification: NONE			+0	
TOTAL SCORE:			42	V. High

Bank Erosion Hazard Index

Erodibility Variable			Bank Erosion Potential: Very Low	Low	Moderate	High	Very High	Extreme
	Bank Height/ Bankfull Height	Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Root Depth/ Bank Height	Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Weighted Root Density	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Bank Angle	Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Surface Protection	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)
Boulders (Banks composed of boulders have low bank erosion potential)
Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	Low	Moderate	High	Very High	Extreme
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

* BANKS WERE RECENTLY CONSTRUCTED & OVERLAIN WITH MATTING. ONCE VEGETATION ESTABLISHES BEHI WILL DROP TO LOW.

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Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
1.5	0.0094	62.4	0.88
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
2.7	0.0094	62.4	1.58
d_{maxnb}	S_{nb}	γ	τ_{nb}

$$\text{Near Bank Stress} = \frac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)} = \boxed{1.80}$$

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
MODERATE	VERY HIGH

Bank Erosion Prediction (ft/yr)	0.3

Circle Curve Used:

Yellowstone
Colorado
Other

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Stream: HANGING ROCK CREEK Reach: Cross Section: # 2 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	3.9	LOW
7.4'	6.2'	1.19		
Root Depth/Bank Height				
* Root Depth (ft) C	C/A		10	EXTREME
0%	0			
Weighted Root Density				
* Root Density (%) D	D*(C/A)		10	EXTREME
0%	0			
Bank Angle				
Bank Angle (degrees)			3.2	LOW
45°				
Surface Protection				
* Surface Protection (%)			10	EXTREME
0%				
Materials: ROOT WADS W/ GRAVEL			+ 5	
Stratification: NONE			Ø	
TOTAL SCORE:			42.1	V. High

Bank Erosion Hazard Index

Erodibility Variable			Bank Erosion Potential					
			Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
	Bank Height/ Bankfull Height	Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Root Depth/ Bank Height	Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Weighted Root Density	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Bank Angle	Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Surface Protection	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)
Boulders (Banks composed of boulders have low bank erosion potential)
Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

* BANKS NEWLY CONSTRUCTED VEGETATION NOT YET ESTABLISHED.

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
2.8	.00016	62.4	0.020 ~~0.26~~
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
6.2	.00016	62.4	0.062
d_{maxnb}	S_{nb}	γ	τ_{nb}

$$\text{Near Bank Stress} = \frac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)} = \boxed{3.1}$$

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
VERY HIGH	VERY HIGH

Bank Erosion Prediction (ft/yr)	0.8

Circle Curve Used:

Yellowstone
Colorado
Other

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Stream: HANGING ROCK CRK Reach: Cross Section: # 3 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	1.0	VERY LOW
2.2	2.2	1.0		
Root Depth/Bank Height				
* Root Depth (ft) C	C/A		10	EXTREME
0'	0			
Weighted Root Density				
* Root Density (%) D	D*(C/A)		10	EXTREME
0%	0			
Bank Angle				
Bank Angle (degrees)			2.5	LOW
30°				
Surface Protection				
* Surface Protection (%)			10	EXTREME
0%				
Materials: LOOSE GRAVEL/SAND			+ 10	
Stratification: NONE			Ø	
TOTAL SCORE:			43.5	V. HIGH

Bank Erosion Hazard Index

Erodibility Variable			Very Low	Low	Moderate	High	Very High	Extreme
			Bank Erosion Potential					
Bank Height/ Bankfull Height	Value		1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
	Index		1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height	Value		1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
	Index		1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density	Value		100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
	Index		1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle	Value		0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
	Index		1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection	Value		100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
	Index		1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)

Boulders (Banks composed of boulders have low bank erosion potential)

Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	Low	Moderate	High	Very High	Extreme
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

* NEWLY CONSTRUCTED BANKS, VEGETATION NOT YET ESTABLISHED.

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Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
1.1	0.0217	62.4	1.49
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
2.9	0.0217	62.4	3.93
d_{maxnb}	S_{nb}	γ	τ_{nb}

$$\text{Near Bank Stress} = \frac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)} = \boxed{2.63}$$

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
VERY HIGH	VERY HIGH

Bank Erosion Prediction (ft/yr)	0.8

Circle Curve Used:

Yellowstone
Colorado
Other

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Stream: HANGING ROCK CRK Reach: Cross Section: # 4 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	4.0	MOD.
4.66	39	1.20		
Root Depth/Bank Height				
Root Depth (ft) C	C/A		8.5	VERY HIGH
0.5	0.11			
Weighted Root Density				
Root Density (%) D	D*(C/A)		10	EXTREME
30	3.3			
Bank Angle				
Bank Angle (degrees)			3.3	LOW
47.3°				
Surface Protection				
Surface Protection (%)			7.2	HIGH
20				
Materials: GRAVEL/SAND			+7	
Stratification: NONE			+0	
TOTAL SCORE:			40	V. HIGH

Bank Erosion Hazard Index

Erodibility Variable		Bank Erosion Potential: *Very Low*	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
Bank Height/ Bankfull Height	Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height	Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle	Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

- Bedrock (Bedrock banks have very low bank erosion potential)
- Boulders (Banks composed of boulders have low bank erosion potential)
- Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
- Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)
- Sand (Add 10 points)
- Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
2.0	0.0005	62.4	0.0624
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
3.9	0.0005	62.4	0.122
d_{maxnb}	S_{nb}	γ	τ_{nb}

$$\text{Near Bank Stress} = \frac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)} = \boxed{1.95}$$

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
MODERATE	VERY HIGH

Bank Erosion Prediction (ft/yr)	0.3

Circle Curve Used:

Yellowstone
Colorado
Other

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Stream: HANGING ROCK CREEK Reach: Cross Section: #5 Date: 10/6/04 Crew: MUCKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	5.0	MOD.
5.17	3.8	1.36		
Root Depth/Bank Height				
Root Depth (ft) C	C/A		7.5	HIGH
1.0	0.20			
Weighted Root Density				
Root Density (%) D	D*(C/A)		8.0	VERY HIGH
70%	14			
Bank Angle				
Bank Angle (degrees)			3.0	LOW
38.5°				
Surface Protection				
Surface Protection (%)			2.2	LOW
70%				
Materials: COBBLE/GRAVEL/SAND			+0	
Stratification: NONE			+0	
TOTAL SCORE:			31.7	HIGH

Bank Erosion Hazard Index

Erodibility Variable			Bank Erosion Potential: Very Low	Low	Moderate	High	Very High	Extreme
Bank Height/ Bankfull Height		Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height		Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density		Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle		Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection		Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)
Boulders (Banks composed of boulders have low bank erosion potential)
Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	Low	Moderate	High	Very High	Extreme
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

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Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
2.5	0.00063	62.4	0.0975
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
3.8	0.00063	62.4	0.148
d_{maxnb}	S_{nb}	γ	τ_{nb}

$$\text{Near Bank Stress} = \frac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)} = \boxed{1.52}$$

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
MODERATE	HIGH

Bank Erosion Prediction (ft/yr)	0.3

Circle Curve Used:

Yellowstone
Colorado
Other

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Stream: HANGING ROCK CREEK Reach: Cross Section: # 6 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	2.5	LOW
2.15	1.9	1.13		
Root Depth/Bank Height				
Root Depth (ft) C	C/A		4.1	MOD
1.0'	0.47			
Weighted Root Density				
Root Density (%) D	D*(C/A)		5.0	MOD.
90%	42.3			
Bank Angle				
Bank Angle (degrees)			1.5	VERY LOW
11.4°				
Surface Protection				
Surface Protection (%)			1.5	VERY LOW
90%				
Materials: GRAVEL/SAND			+6	
Stratification: NONE			+0	
TOTAL SCORE:			20.6	MOD

Bank Erosion Hazard Index

Erodibility Variable		Bank Erosion Potential: Very Low	Low	Moderate	High	Very High	Extreme
Bank Height/ Bankfull Height	Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height	Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle	Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)

Boulders (Banks composed of boulders have low bank erosion potential)

Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	Low	Moderate	High	Very High	Extreme
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

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Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
1.0	0.0076	62.4	0.474
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
1.9	0.0076	62.4	0.901
d_{maxnb}	S_{nb}	γ	τ_{nb}

$$\text{Near Bank Stress} = \frac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)} = \boxed{1.9}$$

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
MODERATE	MODERATE

Bank Erosion Prediction (ft/yr)	0.2

Circle Curve Used:

Yellowstone
Colorado
Other

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Stream: HANGING ROCK CRK Reach: Cross Section: #7 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	4.9	MOD.
2.4	1.7	1.41		
Root Depth/Bank Height				
Root Depth (ft) C	C/A		3.3	LOW
1.5'	0.625			
Weighted Root Density				
Root Density (%) D	D*(C/A)		3.8	LOW
90%	56.3			
Bank Angle				
Bank Angle (degrees)			1.8	VERY LOW
18.8°				
Surface Protection				
Surface Protection (%)			1.5	VERY LOW
90%				
Materials: GRAVEL/SAND			+ 5	
Stratification: NONE			+ 0	
TOTAL SCORE:			20.3	MOD

Bank Erosion Hazard Index

Erodibility Variable			Bank Erosion Potential: Very Low	Low	Moderate	High	Very High	Extreme
	Bank Height/ Bankfull Height	Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Root Depth/ Bank Height	Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Weighted Root Density	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Bank Angle	Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
	Surface Protection	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
		Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)
Boulders (Banks composed of boulders have low bank erosion potential)
Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
Gravel (Add 5-10 points depending on percentage of bank material that is composed of sand)
Sand (Add 10 points)
Silt/Clay (+ 0, no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	*Low*	*Moderate*	*High*	*Very High*	*Extreme*
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
1.3	0.0044	62.4	0.357
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
1.7	0.0044	62.4	0.467
d_{maxnb}	S_{nb}	γ	τ_{nb}

$$\textbf{Near Bank Stress} = \frac{\textbf{Near Bank Shear Stress } (\tau_{nb})}{\textbf{Total Shear Stress } (\tau)} = \boxed{1.31}$$

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
LOW	LOW / MOD.

Bank Erosion Prediction (ft/yr)	0.09

Circle Curve Used:

Yellowstone
Colorado
Other

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Stream: UT to Hanging Rock Cr Reach: Cross Section: # 1 Date: 10/6/04 Crew: MULKEY

Erodibility Variable			Index	Bank Erosion Potential
Bank Height/Bankfull Height				
Study Bank Height (ft) A	Bankfull Height (ft) B	A/B	6.5	High
1.9	1.1	1.73		
Root Depth/Bank Height				
Root Depth (ft) C	C/A		3.7	Low
1.0	0.52			
Weighted Root Density				
Root Density (%) D	D*(C/A)		4.6	MOD
90%	47.4			
Bank Angle				
Bank Angle (degrees)			2.7	Low
32°				
Surface Protection				
Surface Protection (%)			1.1	VERY LOW
95%				
Materials: GRAVEL/SAND (X-VANE)			+6	
Stratification: NONE			+0	
TOTAL SCORE:			24.6	MOD.

Bank Erosion Hazard Index

Erodibility Variable		Bank Erosion Potential: Very Low	Low	Moderate	High	Very High	Extreme
Bank Height/ Bankfull Height	Value	1.0 - 1.1	1.11 - 1.19	1.2 - 1.5	1.6 - 2.0	2.1 - 2.8	>2.8
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Root Depth/ Bank Height	Value	1.0 - 0.9	0.89 - 0.5	0.49 - 0.3	0.29 - 0.15	0.14 - 0.05	<0.05
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Weighted Root Density	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 5.0	<5.0
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Bank Angle	Value	0 - 20	21 - 60	61 - 80	81 - 90	91 - 119	>119
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10
Surface Protection	Value	100 - 80	79 - 55	54 - 30	29 - 15	14 - 10	<10
	Index	1.0 - 1.9	2.0 - 3.9	4.0 - 5.9	6.0 - 7.9	8.0 - 9.0	10

Bank Materials

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- Sand (Add 10 points)
- Silt/Clay (+ 0: no adjustment)

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

Total Score

Very Low	Low	Moderate	High	Very High	Extreme
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Near Bank Stress and Bank Erosion Prediction Form

Total Cross Section			
Bankfull Mean Depth (ft)	Slope	Density of Water (lb/ft^3)	Shear Stress (lb/ft^2)
0.7	.011	62.4	0.48
d_{bkf}	S	γ	τ

Near Bank Third			
Bankfull Max Depth (ft)	Slope	Density of Water lb/ft^3	Shear Stress (lb/ft^2)
1.1	.011	62.4	0.76
d_{maxnb}	S_{nb}	γ	τ_{nb}

$$\text{Near Bank Stress} = \frac{\text{Near Bank Shear Stress } (\tau_{nb})}{\text{Total Shear Stress } (\tau)} = \boxed{1.58}$$

Near Bank Stress Range:	0.5 - 1.0	1.01 - 1.50	1.51 - 2.0	2.01 - 2.5	2.51- 3.0	>3.0
Near Bank Stress Rating:	Very Low	Low	Moderate	High	Very High	Extreme

Near Bank Stress Rating	BEHI Rating
MODERATE	MODERATE

Bank Erosion Prediction (ft/yr)	0.2

Circle Curve Used:

Yellowstone
Colorado
Other

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