THE FUNCTION BASED RAPID STREAM ASSESSMENT (FBRSA) 2024

Presentation Nov 14, 2024

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Maryland Functional Assessment Team

- USEPA R3: Megan Fitzgerald, Natalie Moxley, Christine Mazzarella
- EPR: Cidney Jones & Rich Starr
- USACE: Nick Ozburn, Matt Hynson, Chris Spaur, Jack Dinne
- MDE: Denise Clearwater, Randah Kamel, Alex Sicard
- USFWS: Mark Secrist
- USEPA HQ: Sam Leberg (Orise fellow)
- Additional technical review by multidisciplinary group and field testing assistance from Corps PMs.
- MD DNR Fisheries assistance on applying MBSS to FBRSA
- Funding for EPR provided through EPA grant

OUTLINE

- 1) FCAMS and the Maryland Stream Framework
- 2) Function Based Rapid Stream Assessment overview
- 3) Metrics 1-11

FCAMS AND THE MARYLAND STREAM FRAMEWORK (MSMF)

What is an FCAM?

FCAM= Functional or Conditional Assessment Methodology

'08 Mitigation Rule: Encourages use of FCAMS to determine changes in resource quality instead of reliance on ratios.

<u>FCAMS used in MSMF</u>:
-Function Based Rapid Stream Assessment (FBRSA)

-EPA Rapid Bioassessment Protocol-habitat forms (RBP)

-Stream Buffer quality Assessment (SBQA)

THE MARYLAND STREAM MITIGATION FRAMEWORK

- Tool Description:
  - A process for estimating the value of stream losses (impacts) and gains (mitigation).
  - Relies heavily on FCAMS and incentivizes ecologically strategic mitigation while deterring impacts to our most valuable resources
- Location: https://www.nab.usace.army.mil/Missions/Regulatory/Mitigation/

- Status:
  - History
  - Outreach
  - Official release Sept 2023

- Moving Forward:
  - Training (office and field)
  - Increasing Capabilities (Fish passage, mapping, stream assessment upgrade)
  - Final update in 2025 (V.2.0)

THE MARYLAND STREAM MITIGATION FRAMEWORK
VERSION 1 FINAL (MSMF V.1. FINAL) [1,2,6,7]

BACKGROUND-IMPACTS		BACKGROUND-MITIGATION	
Corps Project ID	NAB-2023-85656	Corps Project ID	NAB-2023-88552
Project Name:	Acme Airport Runway Expansion	Project Name:	Panther Branch Mitigation
County:	Baltimore	County:	Baltimore
Corps PM:	James Brown	Corps PM:	James Brown
Sponsor:	Acme Airports	Sponsor:	NA
Landowner(s):	Acme Airports	Landowner(s):	Bob Smith
Collaborators:	GKH, JMB, CTT	Collaborators:	BTD, MPT
MITIGATION TYPE		Permittee Responsible	

SUMMARY

This example illustrates impacts for a proposed airport and associated permitee responsible mitigation. Only Tabs 1, 2, 3, and 4 were needed. The numbers below auto populate. For impacts purchasing from a mitigation bank, only tabs 1 and 2 would be completed, while the bank would independently have their own workbook with tabs 1 and some combination of 3, 4, 5, 6, and/or Fish Passage dependent on

TALLY OF IMPACTS AND MITIGATION

CALCULATION NAME	FUNCTIONAL FEET (FF)	SUMMARY
STREAM IMPACTS TOTAL	-910	
STREAM MITIGATION TOTAL FOR STREAM CHANNELS	693	
STREAM MITIGATION TOTAL FOR STREAM BUFFERS	217	
STREAM MITIGATION TOTAL FOR FISH PASSAGE[3]	0	
FUNCTIONAL FOOT BALANCE[4]	0	

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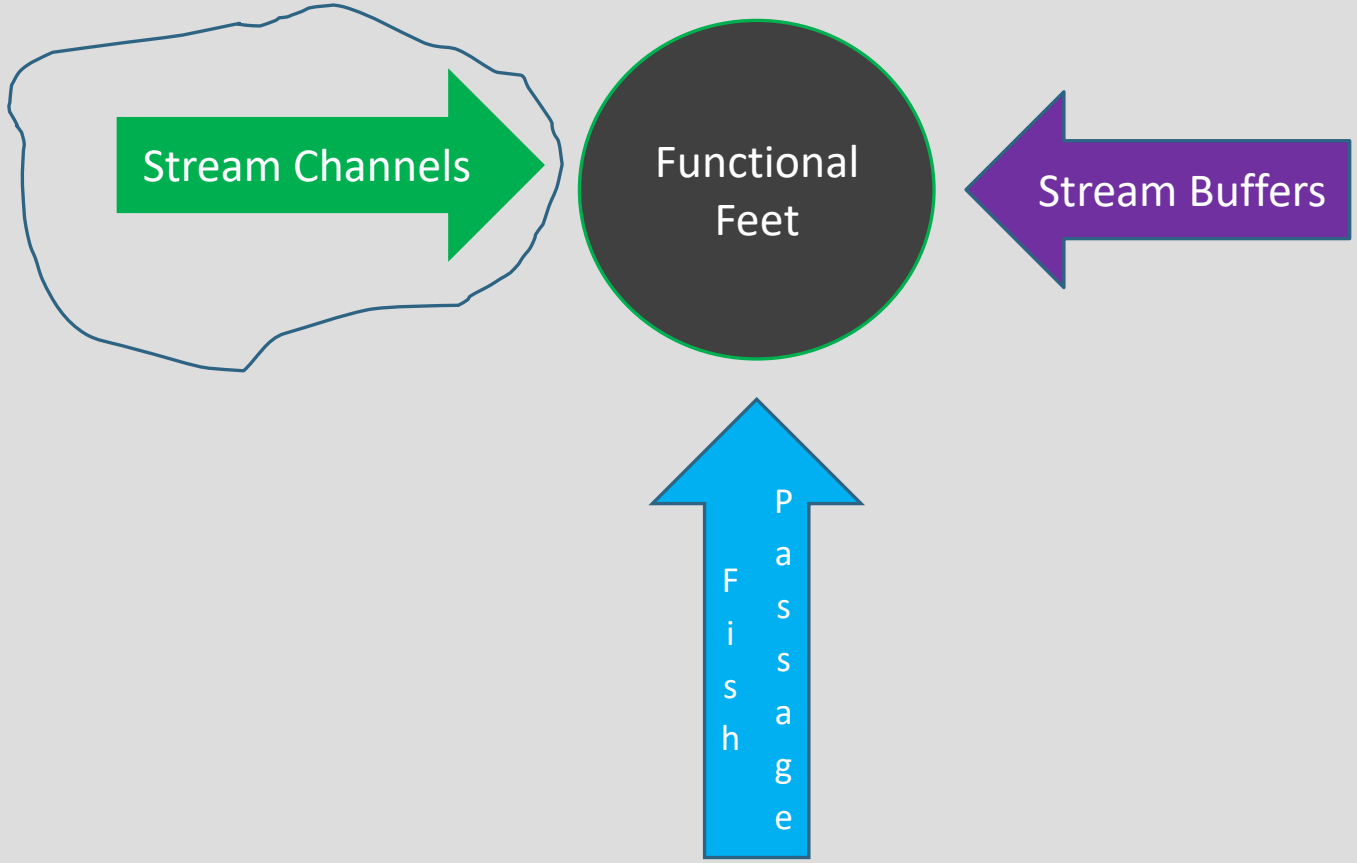
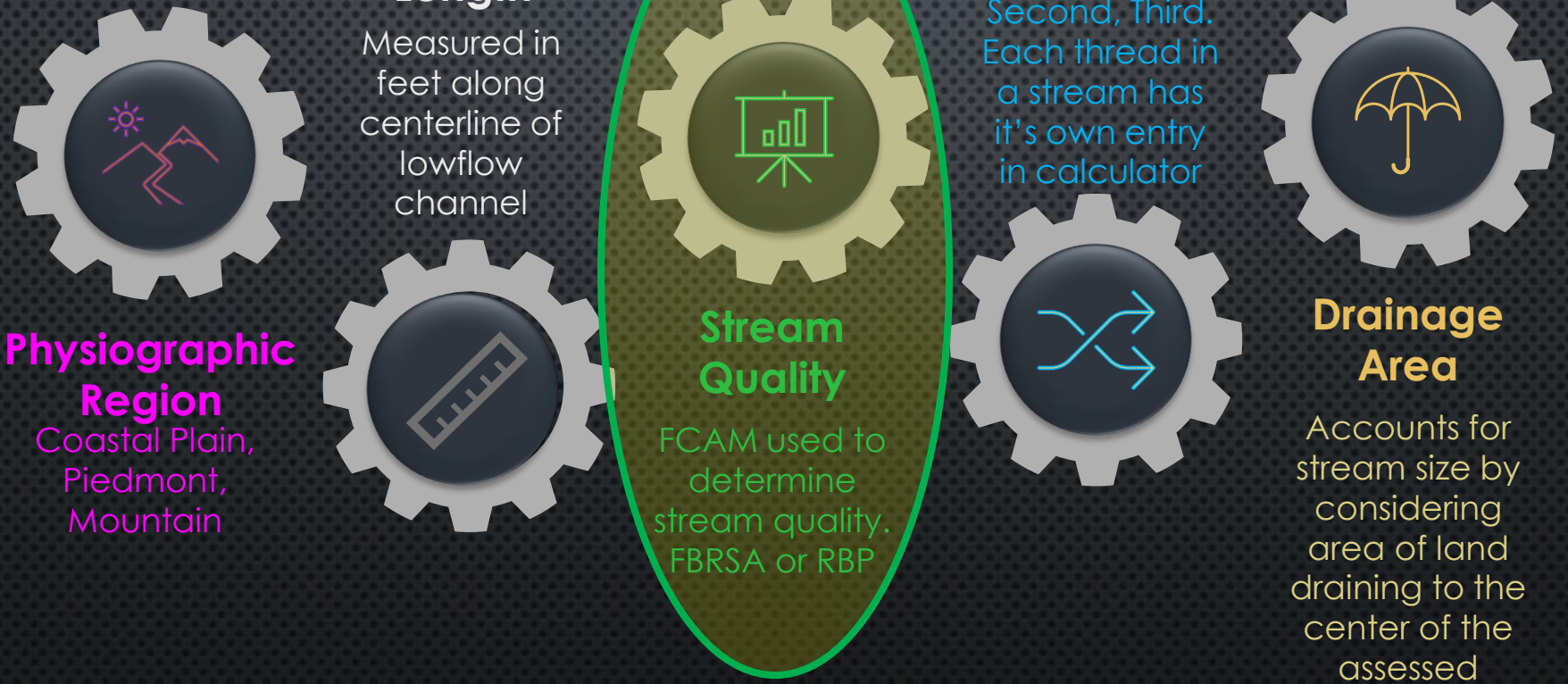
Mitigation Options and Calcs



MSMF RAW REACH VALUE CALCULATION



Physiographic Region
Coastal Plain, Piedmont, Mountain

Stream Length
Measured in feet along centerline of lowflow channel

Stream Quality
FCAM used to determine stream quality. FBRSA or RBP

Channel Thread
Primary, Second, Third. Each thread in a stream has it's own entry in calculator

Drainage Area
Accounts for stream size by considering area of land draining to the center of the assessed reach.

STREAM MITIGATION IN STREAM CHANNELS

Change in Raw Reach Value (FF)

Adjustments

Length delta dilution

Stream Mitigation Calculator (From MSMF Appendix A1, Tab 3)

STREAM MITIGATION CALCULATOR for Stream Channels

BACKGROUND INFORMATION

Corps Project ID #:	NAB-2023-88552	Corps PM:	James Brown
Project Name:	Panther Branch Mitigation	Date:	26-Feb-23
Lat/Long:	38.58960, -76.9567	Sponsor:	Acme Airports
County:	Baltimore	Collaborators:	DBT, CKL

TOTAL STREAM GAINS from Stream Channels (Functional Feet)

693

Reach Name	Physiographic Region	Evaluation	Activity	Resource Type	Length (Feet)	Stream Quality	Channel Thread	Drainage Area (sqmi)	Raw Reach Value (Functional Feet)	Raw Change in Value (Functional Feet)	Adjustments: Change in Reach Length Adjustment	Adjustments: Site Sensitivity	Adjustments: Site Protection	Stream Gains (Functional Feet)	REMARKS (Incude reach coordinates)
reach 1 small perennial ex	Piedmont	Existing	Preliminary Resource Evaluation	Perennial Headwater	1000	35%	Primary	0.5	267	305	No Change	10%	Agricultural Easement / Easement	366	
							1	0.76			0		0.04		
	Piedmont	Proposed	Restoration/Enhancement	Perennial Headwater	1000	75%	Primary	0.5	572		0.5	31	30		36.90899, -76.99889. Main channel of reach 1
							1	0.76			0				
Reach 2 mid perennial example	Piedmont	Existing	Preliminary Resource Evaluation	Perennial Headwater	325	35%	Primary	3	175	200	No Change	10%	Agricultural Easement / Easement	229	
							1	1.53			0		0.04		
	Piedmont	Proposed	Restoration/Enhancement	Perennial Headwater	325	75%	Primary	3	374		0.5	20	10		36.90888, -76.99771
							1	1.53			0				

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											Raw Change in Reach Value (Functional Feet)		Adjustments			Stream Gains (Functional Feet)	REMARKS (Incude reach coordinates)
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FCAM scores go here!!!

FBRSA EXAMPLE:

MITIGATION IS PROPOSED ON A HEADWATER PERENNIAL CHANNEL

STREAM RESTORATION WORK IS PROPOSED TO OFFSET STREAM IMPACTS

COMBINED SCORE SHOWS A DIFFERENCE OF 51% EXISTING VS 87% PROPOSED AFTER THE STREAM IS ASSESSED USING THE FBRSA

-THIS INCLUDED BOTH THE RAPID STREAM ASSESSMENT (PHYSICAL) AND THE MBSS ASSESSMENTS (BIOLOGICAL) COMBINE TO CREATE THE FBRSA SCORE IN % EXISTING VS % PROPOSED

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2024 FUNCTION-BASED RAPID STREAM ASSESSMENT (FBRSA) SCORING SUMMARY SHEET

User must complete the PreSite Visit sheet prior to data entry in this sheet.

	Combined Score	MBSS Score	RSA Score
EXISTING Pre-Project	51%	55%	49%
PROPOSED Post-Project	87%	80%	91%

MBSS Results

Metric #		Existing	Total	Proposed	Total
B1	Benthic IBI (1-5)	3	11.0	4	16.0
B2	Number of EPT Taxa (1-5)	3		4	
B3	Fish IBI (1-5)	3		3	
B4	Abundance / Sq.M. (1-5)	2		5	

Rapid Stream Assessment (RSA) Results

Metric #		Existing	Total	Proposed	Total
R1	WQ	6	54	7	100
R2	Shading	7		5	
R3	Riffle Cover	3		10	
R4	Pool Cover	3		10	
R5	Vel/Depth Diversity	4		8	
R6	Vertical Stability	6		10	
R7	BHR	3		10	
R8	ER	6		10	
R9	FP Soil Drainage	2		10	
R10	BEHI	4		10	
R11	FP Exclusion	10		10	

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Rapid Stream Assessment (RSA) Results

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R1	WQ	6	54	7	100
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R3	Riffle Cover	3		10	
R4	Pool Cover	3		10	
R5	Vel/Depth Diversity	4		8	
R6	Vertical Stability	6		10	
R7	BHR	3		10	
R8	ER	6		10	
R9	FP Soil Drainage	2		10	
R10	BEHI	4		10	
R11	FP Exclusion	10		10	

FBRSA
RAPID STREAM ASSESSMENT
METRICS 1-5

- METRICS 1-5 COVER:
- VISUAL WATER QUALITY ASSESSMENT (R1)
- CHANNEL SHADING (R2)
- RIFFLE/RUN & POOL GLIDE COVER (R 3-4)
- VELOCITY DEPTH DIVERSITY (R-5)

Metric Number	Metric	Applicability	Sampling Extent	Sampling in multi-thread channels
R1	Water Appearance and Nutrient Enrichment	All streams	Whole project reach	Assess primary thread only
R2	Channel Shading	All streams	At least 3 representative locations	Assess all threads
R3	Riffle and Run Complexity	All streams	At least 3 representative riffle/run units	Assess in primary channel, but see metric instructions for scoring multi-thread streams.
R4	Pool and Glide Cover for Aquatic Fauna	All streams	At least 3 representative pool/glide units	
R5	Velocity/Depth Diversity	Perennial streams only	At least 3 representative riffle-pool sequences	Assess percent riffle in primary channel; assess velocity/depth throughout all

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R1: WATER APPEARANCE AND NUTRIENT ENRICHMENT

Instruments: Eyes and Nose
Assessment: Sights & Scents
Sample: Whole Reach

		EX	PRP
FUNCTIONING	***No Impairments or Impairments limited to minimal turbidity, minimal iron floc, or minimal algae.*** *No chemical or sewage odors observed. Very clear, or clear but tea-colored; no oil sheen on surface; no noticeable film on submerged objects or rocks other than natural periphyton and occasional iron residues. Clear water along entire reach; little algal growth or iron flocculant present, but* ***limited to 0-20% of the stream area.***	10	10
		9	9
		8	8
FUNCTIONING-AT-RISK	***Where impervious surface in the drainage area is > 10% Metric score cannot exceed 6.*** *Score can be lower than 6, see scoring criteria below.*		
	Moderate impairments including frequent turbidity and common algal blooms or iron floc. Impairments affect 21-40% of stream area. *No sewage or chemical odors observed. Fairly clear or slightly greenish water along entire reach; no oil sheen on water surface. See Manual for difference between oil sheen and bacterial sheen. Score 6 when one of the following is true, score 4 if both are true: 1. Frequent cloudiness likely, especially after storm events. 2. Common algal growth or iron flocculants on stream substrate noticeable throughout the reach.*		
		6	6
		4	4
NOT FUNCTIONING	***Severe impairments including chemical water pollution (sewage leaks or chemical pollution, nutrient pollution affecting most of the stream).*** *Obvious water pollutants; floating algal mats, gray water, bright green water, surface scum or froths, sheen or heavy coat of foam on surface; or strong odor of chemicals, oil, sewage, or other pollutants. Pea-green, gray, or brown water along entire reach; severe algal blooms creating thick algal mats or iron flocculants in most of the stream. For chemical water pollutants affecting most of stream, score 1. For pollutants limited to excess algae and iron flocculant (* ***covering >40% of the stream area*** *) score 3. If iron floc is indicative of acid mine drainage, score 1.*	3	3
		1	1

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R1: WATER APPEARANCE AND NUTRIENT ENRICHMENT

- WATER TURBIDITY
- POTENTIAL POLLUTANTS AND NUTRIENTS
- INDICATORS
  - SURFACE SCUM
  - OILY SHEEN
  - STRONG ODORS FROM SEWAGE AND CHEMICALS
  - SUBSTRATE COVERED WITH ORANGE MATERIAL
  - GREENISH COLOR FROM EXCESSIVE NUTRIENT INPUTS
  - EXCESSIVE ALGAE AND MACROPHYTES
- SOURCES
  - 303(D) LIST
  - ASSESSMENT REPORTS
  - LAND USE MAPS AND AERIALS
  - SITE VISIT

R2: CHANNEL SHADING

Instruments: Densiometer
Assessment: Whole Reach
Sample: At least 3 representative locations

Metric 2: Channel Shading				**Functional Category: Geomorphology** **Parameter: Riparian Vegetation**						
Applicability: *All stream reaches.* *Purpose* *: This metric is used to assess how much of the water surface within the reach is shaded.* *Materials:* *Convex Densiometer* *Instructions* *: Use a convex densiometer to determine the channel shading at a minimum of 3 representative locations within the reach. Channel shading is specifically the portion of the water surface that is shaded from herbaceous, shrub, and canopy strata.* ***Multi-thread channels:*** *Assess each thread to determine the percent of water surface that is shaded throughout the whole reach.*										
% Shaded:										
Location:										
FUNCTIONING				**FUNCTIONING-AT-RISK**				**NOT FUNCTIONING**		
≥75% - 50% of the water surface is shaded within the reach.				49% - 20% of the water surface is shaded within the reach.				20% - 0% of the water surface is shaded within the reach.		
EX	10	9	8	7	6	5	4	3	2	1
PRP	10	9	8	7	6	5	4	3	2	1

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METRICS R3-5: SETUP HABITAT SAMPLING AREA

Instruments: 300 ft tape, pocket rod
Assessment: 3 Riffle/Pool Sequences
Sample: Observe cover types, cover extent, and velocity/depth regimes

TABLE 3. Habitat Sampling Area

RIFFLE/RUNS (R) : *Riffles are shallow, steep-gradient channel segments typically located between pools. Riffles also refer to the cross-over section in single-thread sand bed streams and the cascade section of steep mountain streams. Run features are generally included with riffles. *The precense/absence of different velocity/depth regimes is used to score Metric R5.*

POOL/GLIDES (P): *Pools are (1) deeper than the riffle, (2) have a laterally and longitudinally concave shaped bed surface, and (3) a width that is at least half the width of the wetted channel. Pools sometimes also have a water surface slope that is flatter than the riffle. Glides are included with pools in this assessment. *The precense/absence of different velocity/depth regimes is used to score Metric R5.*

	R1	P1	R2	P2	R3	P3	R4	P4
Length (ft):								
*Depth to WS (ft):								
*Vel. > 1 fps or < 1 fps:								
Length with cover (ft):								

Cover notes: (1) All cover types must be fixed, not mobile. (2) Do not include shot rock (furnished material of uniform size) riffles as cover for Cobble or Boulder voids. (3) In pools - From a cross-section view, consider only the deepest part of the pool.

Check Cover Features	R1	P1	R2	P2	R3	P3	R4	P4
Large wood/fallen trees (> 2' long and 4" diam.)								
Boulder voids								
Cobble voids								
Flat boulder cover								
Overhangs (>0.3 ft								
Dense live roots in contact with baseflow								
Macrophyte beds/floating veg.								
Micro pools (RIFFLE ONLY)								
Gravel spawning beds (GLIDES ONLY)								

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R3: RIFFLE/RUN COMPLEXITY

Figure 14. Dense macrophyte bed and logs within this riffle.

	Cover Density Length assessed with cover present	EX	PRP	Cover Diversity # Cover Types present in sampling area		EX	PRP
				Sand Bed Streams	Other Streams		
F	≥70%	5	5	4+	5+	5	5
	40-69%	4	4	3	4	4	4
FAR	20-39%	3	3	2	3	3	3
	5-19%	2	2	1	2	2	2
NF	< 5%	1	1		1	1	1
				0	0	0	0
SUM the scores for Density and Diversity.							

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R4: POOL/GLIDE COVER

Total Length of pool/glide features (ft):			Length with cover (ft):		Length with cover (%):		
	Cover Density Length assessed with cover present	**EX**	**PRP**	**Cover Diversity** # Cover Types present in sampling area: Sand Bed Streams	Other Streams	**EX**	**PRP**
F	≥60%	5	5	4+	5+	5	5
	40-59%	4	4	3	4	4	4
FAR	25-39%	3	3	2	3	3	3
	15-24%	2	2	1	2	2	2
NF	< 15%	1	1		1	1	1
				0	0	0	0
SUM the scores for Density and Diversity.							

Figure 18. Pool with very low cover in the thalweg, the rootwad on the right does not provide cover in the deepest portion of the cross-section and is not counted.

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RECORDING HABITAT COVER IN MULTI-THREAD FEATURES

Multi-thread Channels *Instructions: (1) After assessing the primary channel using the instructions above in the habitat sampling area (3 riffle-run features), walk the whole stream reach. (2) Record the total length of side channel features (channels and oxbows below bankfull) within the reach which have perennial flow and are at least 1 ft wide. (3) Determine if length of all side channels is equal to at least 20% of the total reach length. If yes, (4) visually estimate the percent of cover in side channel riffles. (5) visually estimate the percent of the side channels with pool/glide habitat and cover features.*							
Length of side channels (ft):							
Length with riffle/run cover features (ft):							
Length with pool/glide cover features (ft):							

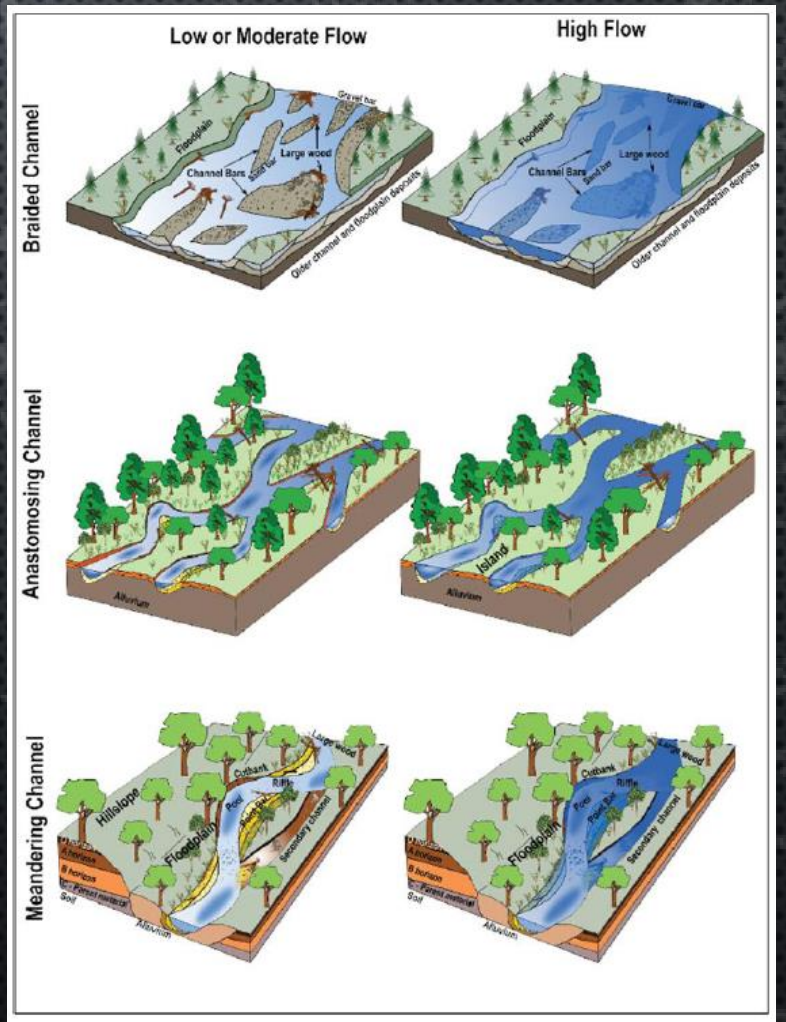

Figure 1. Braided, anastomosing, and meandering single-thread channels. Figure from USACE 2022, adapted from Suazo-Davila et al. 2013.

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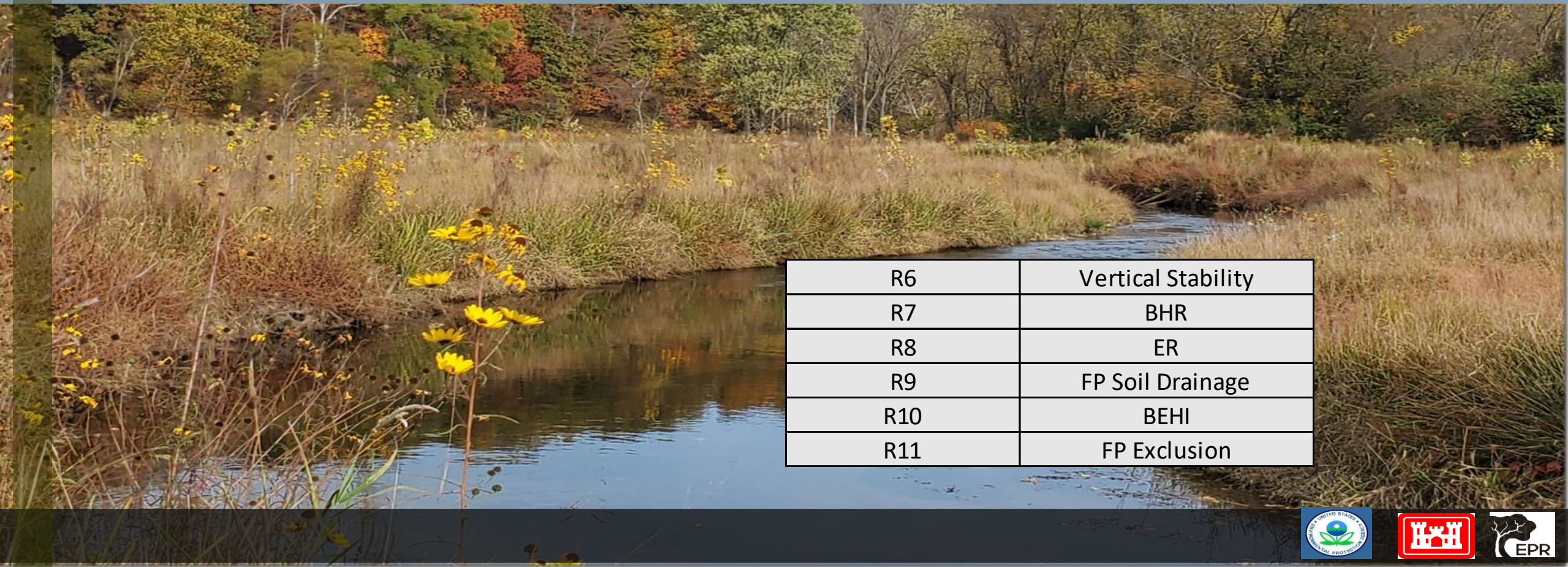
2024 FBRSA
RSA Metrics R6 - R11



R6	Vertical Stability
R7	BHR
R8	ER
R9	FP Soil Drainage
R10	BEHI
R11	FP Exclusion

Metric R6 – Vertical Stability Extent

Applicability: This metric is applicable to all streams.

Purpose: Vertical stability extent characterizes the potential of localized or widespread downward streambed adjustments.

-Essentially a headcut inspection

-Also considers risk of structures or drops that are unnecessarily high. These can put projects at risk.

Metric R6 – Vertical Stability Extent

Functional Capacity	FUNCTIONING			FUNCTIONING-AT-RISK				NOT FUNCTIONING		
Narrative Criteria	Grade control provided by numerous tree roots, embedded wood, rock structures or riffles. Abrupt drops 0.5 ft or less			Stream bed controlled by numerous tree roots, embedded wood, rock structures or low sloped riffles. Abrupt drops 0.6 - 1 ft		Stream bed controlled by abrupt drops exceeding 1 ft. Moderate head cutting observed.		Widespread Instability, active head cuts common and/or severe head cuts or abrupt drops 2 ft or greater		
Rating	10	9	8	7	6	5	4	3	2	1

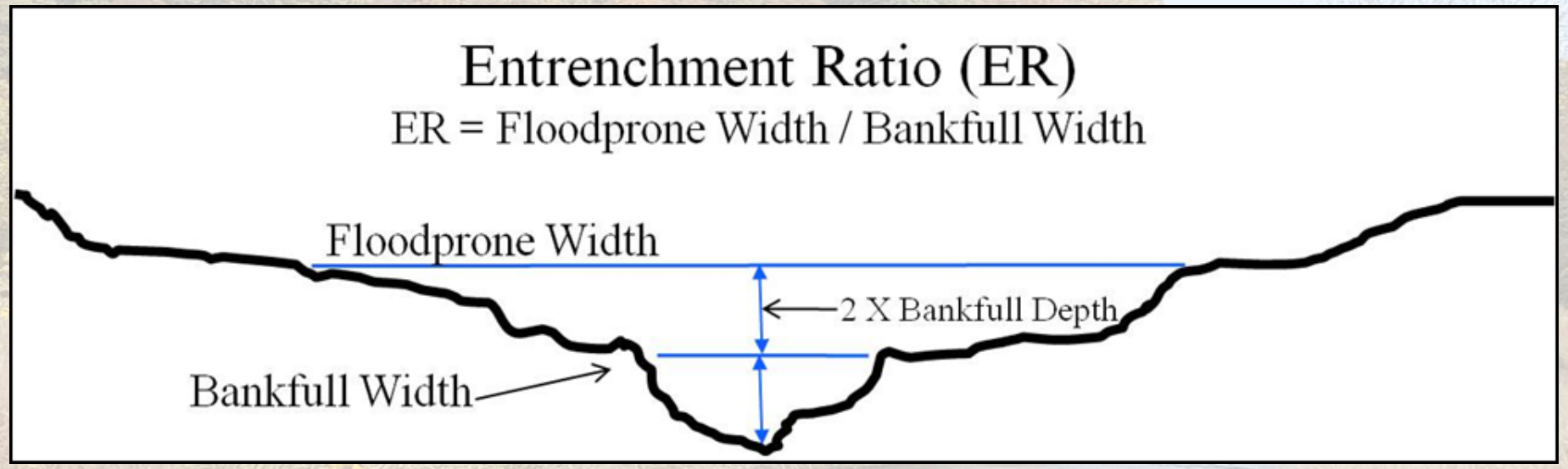
Scoring for reaches with slope < 2% shown above.
Slopes 2-5% reaches drop heights are 1’ for functioning, 1-1.5’ and > 1.5’ for FAR.
Slopes > 5% focus on regular grade control for functioning conditions. Some or sparse grade control for FAR.

Metric R7 – Bank Height Ratio (BHR)

FUNCTIONING			FUNCTIONING-AT-RISK				NOT FUNCTIONING		
≤ 1.00 - 1.20			1.21 - 1.49				1.50 - > 1.70		
10	9	8	7	6	5	4	3	2	1

- Frequency of flood flows to floodplain
- In-office – plan set cross sections and longitudinal profile
- Field – pocket rod and hand level or 2 rods and a line level
  - measure from riffle dmax to bankfull
  - measure from riffle dmax to low bank

Metric R8 – Entrenchment Ratio



- ER = FPW / W, where
- FPW = floodprone width, measured at a stage of 2 times the bankfull max depth
- W = bankfull riffle width

Metric R8 – Entrenchment Ratio

Functional Capacity	FUNCTIONING			FUNCTIONING-AT-RISK				NOT FUNCTIONING		
Average ER Value for the reach	≥ 20.0 - 3.7			3.6 - 1.5				1.4 - 1.0		
Rating	10	9	8	7	6	5	4	3	2	1

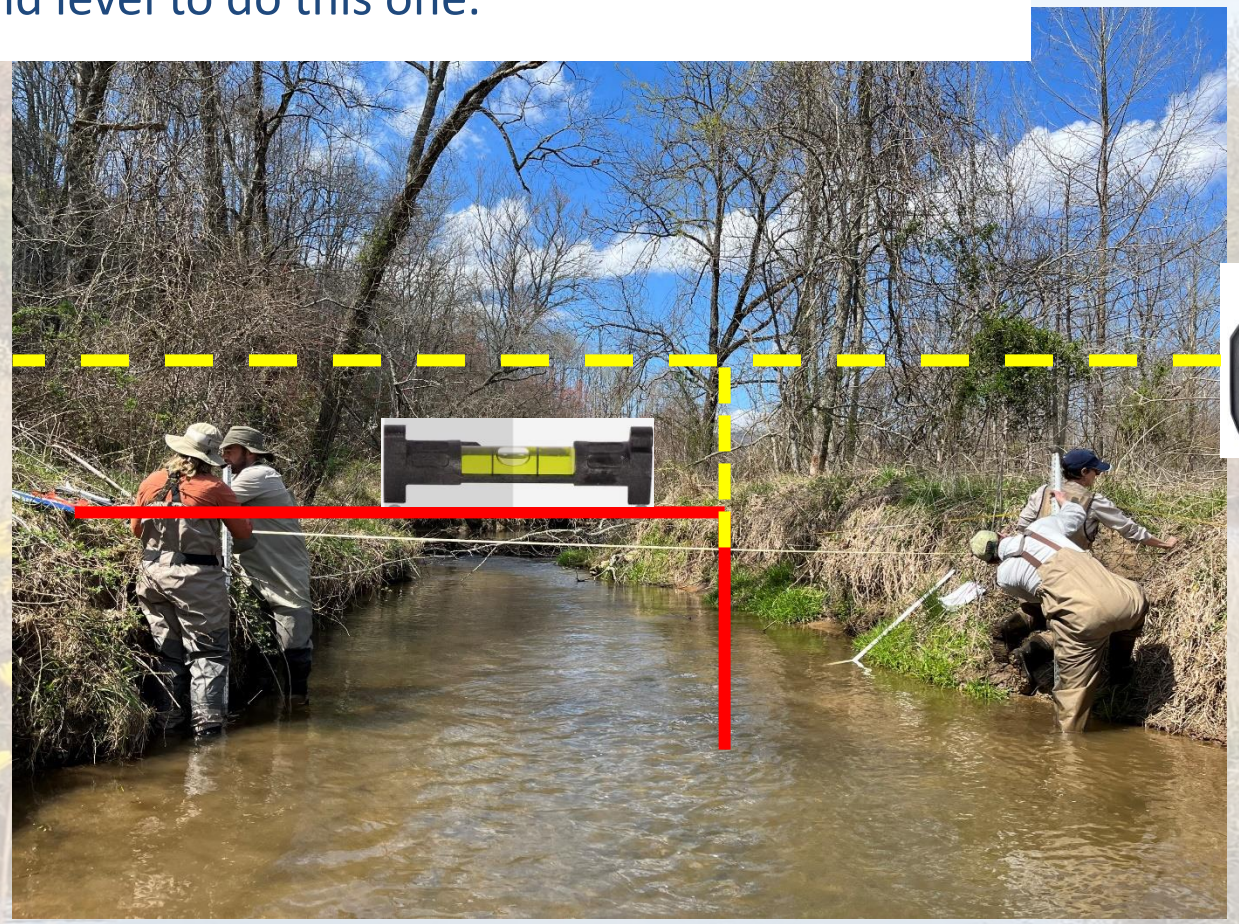
Functional Capacity	FUNCTIONING			FUNCTIONING-AT-RISK				NOT FUNCTIONING		
Average ER Value for the reach	≥ 2.2 - 1.5			1.4 - 1.2				1.1 - 1.0		
Rating	10	9	8	7	6	5	4	3	2	1

- Amount of floodplain area available for flood flows
- Erosion potential associated with flood flows
- Two categories
  - Unconfined alluvial valleys
  - Confined alluvial or colluvial valleys

Measure BHR & ER at US and DS ends of the reach.

Low bank height – TW to lower of the two banks. May need a hand level to do this one.

Low bank



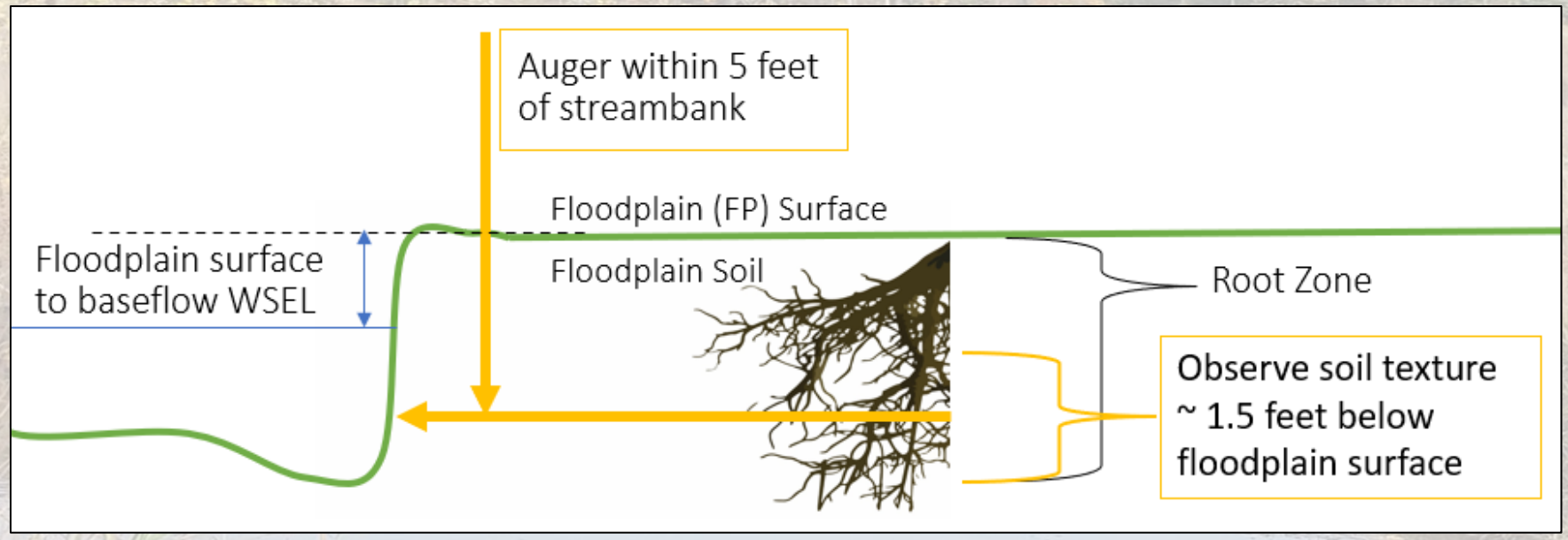
Metric R9 – Floodplain Soil Drainage

Applicability: Streams that naturally support(ed) or could support a stream-wetland complex.

Purpose: Capture the benefits of floodplain soil saturation and the ecological loss when the valley substrates and riparian community are drained.

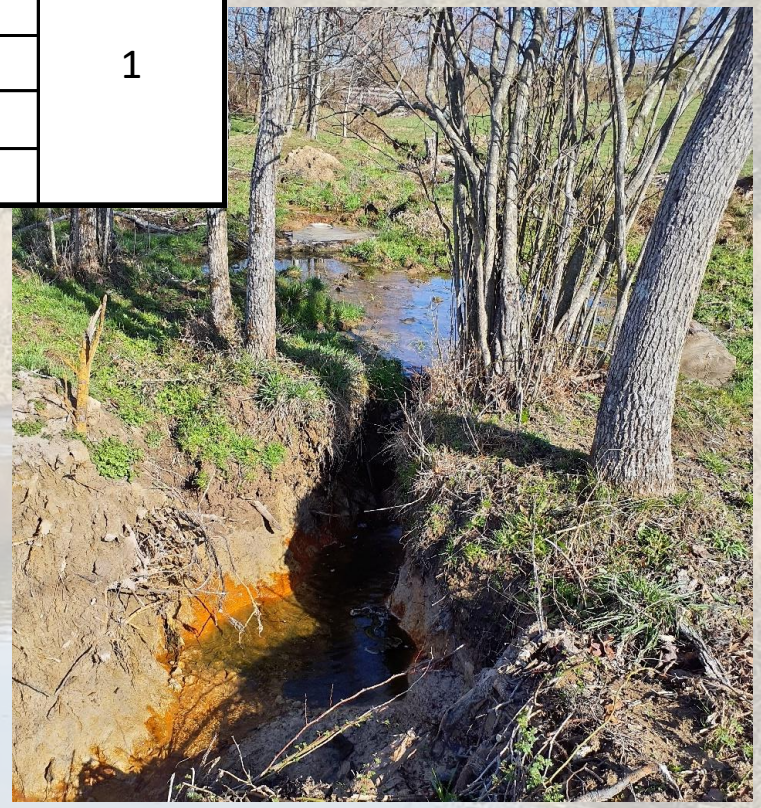
Metric R9 – Floodplain Soil Drainage

Soil texture	PRE			
	Depth from FP surface to baseflow WSEL			
	≤ 1.0	1.01-1.25	1.26-1.50	> 1.50
GBL	10	7	2	1
silty sand, or loamy sand,	8	5	2	
clayey gravel, sandy silt, or	6	3	1	
sandy clay, clay loam, silty	2	2	1	
silty clay and clay	1	1	1	



Metric R9 – Floodplain Soil Drainage

Soil texture	PRE			
	Depth from FP surface to baseflow WSEL			
	≤ 1.0	1.01-1.25	1.26-1.50	> 1.50
GBL	10	7	2	1
silty sand, or loamy sand,	8	5	2	
clayey gravel, sandy silt, or	6	3	1	
sandy clay, clay loam, silty	2	2	1	
silty clay and clay	1	1	1	



Metric R10 – Streambank Erosion Extent and Magnitude

Dominant BEHI Category	PRE			
	Percent Eroding Streambank			
	5-9%	10-49%	50-75%	> 75%
Moderate	10	7	3	1
High	10	6	3	
Very High	9	5	2	
Extreme	8	4	1	

- Appendix E has guidance and photos!!!
- Estimates potential for erosion based on bankfull flow conditions.
- BEHI total score of 25 and greater are considered eroding.
- Dominant BEHI is the rating that represents largest portion of eroding banks.

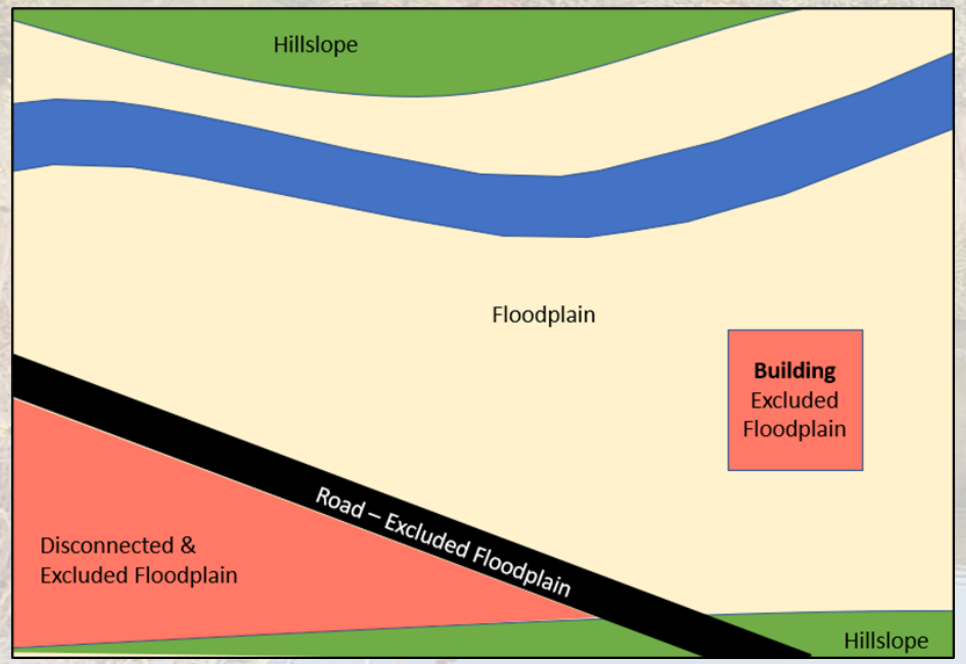
BEHI Score = 45 out of 50 – Eroding

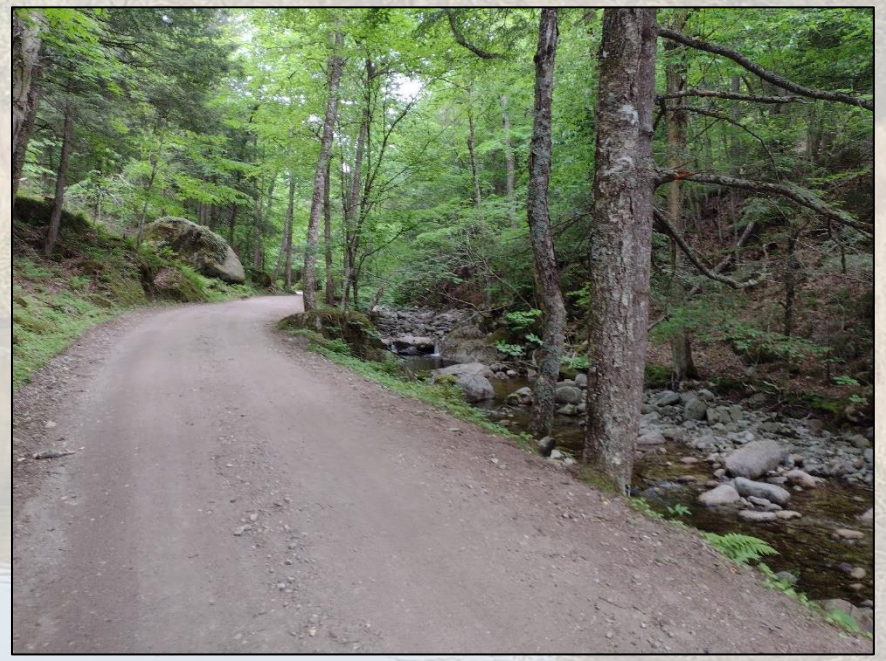
Scores										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A	1	1.1	1.2	1.3	1.4	1.5	1.8	2.1	2.8	>2.8
B	≥ 0.95	0.9	0.7	0.5	0.4	0.3	0.2	0.15	0.05	<0.05
C	≥ 90	80	75	55	40	30	20	15	5	<5
D	0	20	40	60	70	80	85	90	120	>120
E	≥ 90	80	65	55	40	30	20	15	10	<10

(A) Score (1-10) Study bank H/BKF	9
(B) Score (0-10) Root D/Study bank H	10
(C) Score (0-10) Weighted Root Density; Look at whole bank height.	10
(D) Score (1-10) Bank Angle	7
(E) Score (0-10) Surface Protection (%)	9
Adjustments	0
Total (Eroding ≥ 25)	45

Metric R11 – Anthropogenic FP Exclusions

Functional Capacity	FUNCTIONING			FUNCTIONING-AT-RISK				NOT FUNCTIONING		
Percent active valley bottom excluded	0% - 10%			11% - 20%		21% - 30%		31% - > 50%		
Rating	10	9	8	7	6	5	4	3	2	1





EXAMPLE:

MITIGATION IS PROPOSED ON A HEADWATER PERENNIAL CHANNEL

STREAM RESTORATION WORK IS PROPOSED TO OFFSET STREAM IMPACTS

COMBINED SCORE SHOWS A DIFFERENCE OF 51% EXISTING VS 87% PROPOSED AFTER THE STREAM IS ASSESSED USING THE FBRSA

-THIS INCLUDED BOTH THE RAPID STREAM ASSESSMENT (PHYSICAL) AND THE MBSS ASSESSMENTS (BIOLOGICAL) COMBINE TO CREATE THE FBRSA SCORE IN % EXISTING VS % PROPOSED

2024 FUNCTION-BASED RAPID STREAM ASSESSMENT (FBRSA) SCORING SUMMARY SHEET

User must complete the PreSite Visit sheet prior to data entry in this sheet.

	Combined Score	MBSS Score	RSA Score
EXISTING Pre-Project	51%	55%	49%
PROPOSED Post-Project	87%	80%	91%

MBSS Results

Metric #		Existing	Total	Proposed	Total
B1	Benthic IBI (1-5)	3	11.0	4	16.0
B2	Number of EPT Taxa (1-5)	3		4	
B3	Fish IBI (1-5)	3		3	
B4	Abundance / Sq.M. (1-5)	2		5	

Rapid Stream Assessment (RSA) Results

Metric #		Existing	Total	Proposed	Total
R1	WQ	6	54	7	100
R2	Shading	7		5	
R3	Riffle Cover	3		10	
R4	Pool Cover	3		10	
R5	Vel/Depth Diversity	4		8	
R6	Vertical Stability	6		10	
R7	BHR	3		10	
R8	ER	6		10	
R9	FP Soil Drainage	2		10	
R10	BEHI	4		10	
R11	FP Exclusion	10		10	

Stream Mitigation Calculator (From MSMF Appendix A1, Tab 3)

STREAM MITIGATION CALCULATOR for Stream Channels

BACKGROUND INFORMATION

Corps Project ID #:		Corps PM:	
Project Name:		Date:	
Lat/Long:		Sponsor:	
County:		Collaborators:	

TOTAL STREAM GAINS from Stream Channels (Functional Feet)

469

Raw Change in Reach Value (Functional Feet)											Adjustments			Stream Gains (Functional Feet)	REMARKS (Incude reach coordinates)
Reach Name	Physiographic Region	Evaluation	Activity	Resource Type	Length (Feet)	Stream Quality	Channel Thread	Drainage Area (sqmi)	Raw Reach Value (Functional Feet)	Raw Change in Value (Functional Feet)	Change in Reach Length Adjustment	Site Sensitivity	Site Protection		
Reach 1	Piedmont	Existing	Preliminary Resource Evaluation	Perennial Headwater	1000	51%	Primary	1.2	548	387	No Change	10%	No Existing Protection	Easement	469	
							1	1.07			0		0.05			
	Piedmont	Proposed	Restoration/Enhancement	Perennial Headwater	1000	87%	Primary	1.2	934		0.5	39	44			Restoration of reach 1 at 36.85996, -76.77895
							1	1.07			0					

FCAM scores go here!!!

QUESTIONS