

WILDLIFE

WEST VIRGINIA

DIVISION

OF

NATURAL RESOURCES



Learning to “SWVM”

SWVM v2.1 for WVDEP

Date: August 20, 2013



®

US Army Corps of Engineers
BUILDING STRONG®



SWVM Application

- Pro's [What it can do...]
 - ▶ HGM and SWVM integrated approach
 - ▶ Impact and mitigation assessments (baseline and projected)
 - ▶ Utilized to evaluate project alternatives
 - ▶ Monitor the performance of restored ecosystems (Mitigation)
 - ▶ Transparency of impacts and mitigation to all parties including: Applicant, Agent/ Consultant, Sponsors (Mit. Banks), General Public, Permit Reviewers



SWVM Application

- Pro's [What it can do...] (cont'd)
 - ▶ Correlates impacts of all (wadeable) stream classes (Eph, Int and Per) with similar forms of stream compensatory mitigation
 - ▶ Provides overview of an impact and mitigation project (areas of projected functional lift visible at a glance)
 - ▶ Multiple Site Tabulation Sheet (i.e. Debits and Credits)
 - ▶ Incorporates factors and values considered in our evaluations
 - ▷ Temporal Loss
 - ▷ Long-term Protection
 - ▷ Water Chemistry
 - (if lights are "ON" we want somebody to be home...)*
 - ▷ Extent of Work Incentive
 - ▷ Extended Buffer Width Incentive
 - ▶ Can assess "sole preservation" (under v2.1)



Stream Parts I and II (Tab 1)

West Virginia Stream and Wetland Valuation Metric (SWVM) v2.1

(Stream Valuation Metric - Worksheet 1 of 3)

USE FILE NO./Project Name:			IMPACT COORDINATES:			Lat.	Lon.	WEATHER:			DATE:												
Labor Creek WV SWVM v2.1			(In Decimal Degrees)								8/19/2011												
IMPACT STREAM/SITE ID AND SITE DESCRIPTION:						MITIGATION STREAM CLASS/SITE ID AND SITE DESCRIPTION:						Comments:											
(Detailed site (page), outlined or highlighted)						(Detailed site (page), outlined or highlighted)																	
STREAM IMPACT LENGTH:			FORM OF MITIGATION:			MIT COORDINATES:			PRECIPITATION PAST 48 HRS:			Mitigation Length:											
500			ENHANCEMENT			(In Decimal Degrees)						1425											
Column No. 1- Impact Existing Condition (Debit)				Column No. 2- Mitigation Existing Condition - Baseline (Credit)				Column No. 2- Mitigation Existing Condition - Baseline (Credit)				Column No. 2- Mitigation Existing Condition - Baseline (Credit)				Column No. 2- Mitigation Existing Condition - Baseline (Credit)							
Stream Classification:		Intermittent		Stream Classification:		Intermittent		Stream Classification:		Intermittent		Stream Classification:		Intermittent		Stream Classification:		Intermittent					
Percent Stream Channel Slope		4		Percent Stream Channel Slope		6		Percent Stream Channel Slope		6		Percent Stream Channel Slope		6		Percent Stream Channel Slope		6					
HGM Score (attach data forms):				HGM Score (attach data forms):				HGM Score (attach data forms):				HGM Score (attach data forms):				HGM Score (attach data forms):							
Average				Average				Average				Average				Average							
Hydrology		0.8		Hydrology		0.7		Hydrology		0.8		Hydrology		0.8		Hydrology		0.8					
Biogeochemical Cycling		0.8		Biogeochemical Cycling		0.78		Biogeochemical Cycling		0.8		Biogeochemical Cycling		0.8		Biogeochemical Cycling		0.8					
Habitat		0.7		Habitat		0.8		Habitat		0.8		Habitat		0.8		Habitat		0.8					
PART I - Physical, Chemical and Biological Indicators				PART I - Physical, Chemical and Biological Indicators				PART I - Physical, Chemical and Biological Indicators				PART I - Physical, Chemical and Biological Indicators				PART I - Physical, Chemical and Biological Indicators							
PHYSICAL INDICATOR (Applies to all stream classifications)				PHYSICAL INDICATOR (Applies to all stream classifications)				PHYSICAL INDICATOR (Applies to all stream classifications)				PHYSICAL INDICATOR (Applies to all stream classifications)				PHYSICAL INDICATOR (Applies to all stream classifications)							
USDEPA RSP (High Gradient Data Sheet)				USDEPA RSP (High Gradient Data Sheet)				USDEPA RSP (High Gradient Data Sheet)				USDEPA RSP (High Gradient Data Sheet)				USDEPA RSP (High Gradient Data Sheet)							
1. Epifaunal Substrate/Available Cover		0.20		1. Epifaunal Substrate/Available Cover		0.20		1. Epifaunal Substrate/Available Cover		0.20		1. Epifaunal Substrate/Available Cover		0.20		1. Epifaunal Substrate/Available Cover		0.20					
2. Embeddedness		0.20		2. Embeddedness		0.20		2. Embeddedness		0.20		2. Embeddedness		0.20		2. Embeddedness		0.20					
3. Velocity/Depth Ratios		0.20		3. Velocity/Depth Ratios		0.20		3. Velocity/Depth Ratios		0.20		3. Velocity/Depth Ratios		0.20		3. Velocity/Depth Ratios		0.20					
4. Sediment Deposition		0.20		4. Sediment Deposition		0.20		4. Sediment Deposition		0.20		4. Sediment Deposition		0.20		4. Sediment Deposition		0.20					
5. Channel Flow Status		0.20		5. Channel Flow Status		0.20		5. Channel Flow Status		0.20		5. Channel Flow Status		0.20		5. Channel Flow Status		0.20					
6. Channel Alteration		0.20		6. Channel Alteration		0.20		6. Channel Alteration		0.20		6. Channel Alteration		0.20		6. Channel Alteration		0.20					
7. Frequency of Riffles (or bends)		0.20		7. Frequency of Riffles (or bends)		0.20		7. Frequency of Riffles (or bends)		0.20		7. Frequency of Riffles (or bends)		0.20		7. Frequency of Riffles (or bends)		0.20					
8. Bank Stability (L & R)		0.20		8. Bank Stability (L & R)		0.20		8. Bank Stability (L & R)		0.20		8. Bank Stability (L & R)		0.20		8. Bank Stability (L & R)		0.20					
9. Vegetative Protection (L & R)		0.20		9. Vegetative Protection (L & R)		0.20		9. Vegetative Protection (L & R)		0.20		9. Vegetative Protection (L & R)		0.20		9. Vegetative Protection (L & R)		0.20					
10. Riparian Vegetative Zone Width (L & R)		0.20		10. Riparian Vegetative Zone Width (L & R)		0.20		10. Riparian Vegetative Zone Width (L & R)		0.20		10. Riparian Vegetative Zone Width (L & R)		0.20		10. Riparian Vegetative Zone Width (L & R)		0.20					
Total RSP Score		Optimal		Total RSP Score		Marginal		Total RSP Score		Suboptimal		Total RSP Score		Optimal		Total RSP Score		Optimal					
Sub-Total		0.93		Sub-Total		0.82		Sub-Total		0.75		Sub-Total		0.848		Sub-Total		0.92					
CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)				CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)				CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)				CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)				CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)							
WQDEP Water Quality Indicators (General)				WQDEP Water Quality Indicators (General)				WQDEP Water Quality Indicators (General)				WQDEP Water Quality Indicators (General)				WQDEP Water Quality Indicators (General)							
Specific Conductivity		0.80		Specific Conductivity		0.80		Specific Conductivity		0.80		Specific Conductivity		0.80		Specific Conductivity		0.80					
100-199 = 85 points		190		300-399 = 70 points		375		200-299 = 80 points		250		200-299 = 80 points		200		200-299 = 80 points		200					
pH		0.80		pH		0.80		pH		0.80		pH		0.80		pH		0.80					
5.6-5.9 = 45 points		5.8		4.6-5.5 = 10 points		5.1		5.6-5.9 = 45 points		5.6		5.6-5.9 = 45 points		5.6		5.6-5.9 = 45 points		5.6					
DO		0.80		DO		0.80		DO		0.80		DO		0.80		DO		0.80					
>5.0 = 30 points		5		>5.0 = 30 points		5		>5.0 = 30 points		5		>5.0 = 30 points		5		>5.0 = 30 points		5					
Sub-Total		0.8		Sub-Total		0.55		Sub-Total		0.775		Sub-Total		0.775		Sub-Total		0.775					
BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)				BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)							
WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)				WV Stream Condition Index (WVSCI)							
Very Good		0.100		Fair		0.100		Very Good		0.100		Very Good		0.100		Very Good		0.100					
0.1-0.1		80		0.1-0.1		60		0.1-0.1		80		0.1-0.1		88		0.1-0.1		88					
Sub-Total		0.8		Sub-Total		0.8		Sub-Total		0.8		Sub-Total		1		Sub-Total		1					
PART II - Index and Unit Score				PART II - Index and Unit Score				PART II - Index and Unit Score				PART II - Index and Unit Score				PART II - Index and Unit Score							
Index		Linear Feet		Unit Score		Index		Linear Feet		Unit Score		Index		Linear Feet		Unit Score		Index		Linear Feet		Unit Score	
0.772		500		385.833333		0.603333333		1425		859.75		0.7875		1425		1122.1875		0.836666667		1425		1192.25	
0.772				0.603333333				0.7875				0.836666667				0.849166667							

Impact

Baseline Mitigation

Mitigation Projected at 5 yrs

Mitigation Projected at 10 yrs

Mitigation Projected Maturity

Column No. 1- Impact Existing Condition (Debit)

Column No. 2- Mitigation Existing Condition - Baseline (Credit)

HGM Score (attach data forms):	Average	
Hydrology	0	0
Biogeochemical Cycling	0	
Habitat	0	

HGM Score (attach data forms):	Average	
Hydrology	0	0
Biogeochemical Cycling	0	
Habitat	0	

PART I - Physical, Chemical and Biological Indicators

PART I - Physical, Chemical and Biological Indicators

	Points Scale	Range	Site Score
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	Points Scale	Range	Site Score
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PHYSICAL INDICATOR (Applies to all streams classifications)

PHYSICAL INDICATOR (Applies to all streams classifications)

USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	0
2. Embeddedness	0-20		0
3. Velocity/ Depth Regime	0-20		0
4. Sediment Deposition	0-20		0
5. Channel Flow Status	0-20		0
6. Channel Alteration	0-20		0
7. Frequency of Riffles (or bends)	0-20		0
8. Bank Stability (LB & RB)	0-20		0
9. Vegetative Protection (LB & RB)	0-20		0
10. Riparian Vegetative Zone Width (LB & RB)	0-20		0
Total RBP Score	Poor		0
Sub-Total			0

USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	20
2. Embeddedness	0-20		15
3. Velocity/ Depth Regime	0-20		18
4. Sediment Deposition	0-20		18
5. Channel Flow Status	0-20		20
6. Channel Alteration	0-20		20
7. Frequency of Riffles (or bends)	0-20		20
8. Bank Stability (LB & RB)	0-20		16
9. Vegetative Protection (LB & RB)	0-20		8
10. Riparian Vegetative Zone Width (LB & RB)	0-20		20
Total RBP Score	Optimal		175
Sub-Total			0.875

CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)

CHEMICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WVDEP Water Quality Indicators (General)				
Specific Conductivity				
100-199 - 85 points	0-90	0-1	0	
pH				
5.6-6.0 = 45 points	0-80		0	
DO				
>5.0 = 30 points	10-30		0	
Sub-Total				

WVDEP Water Quality Indicators (General)				
Specific Conductivity				
100-199 - 85 points	0-90	0-1	123	
pH				
6.0-8.0 = 80 points	5-90		7.55	
DO				
>5.0 = 30 points	10-30		10.89	
Sub-Total			0.975	

BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)

BIOLOGICAL INDICATOR (Applies to Intermittent and Perennial Streams)

WV Stream Condition Index (WVSCI)			
0	0-100	0-1	0
Sub-Total			0

WV Stream Condition Index (WVSCI)			
Very Good	0-100	0-1	85
Sub-Total			0.85

PART II - Index and Unit Score

Index	Linear Feet	Unit Score
0.325	0	0

PART II - Index and Unit Score

Index	Linear Feet	Unit Score
0.9	3017	2715.3



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Stream Parts III-VI (Tab 2)

West Virginia Stream and Wetland Valuation Metric (SWVM) v2.1

(Stream Valuation Metric - Worksheet 2 of 3)

PART III - Impact Factors (See instruction page to insert default values for MITIGATION BANKING and ILF)			
Temporal Loss-Construction <i>*Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).</i>			
Years	2		
Sub-Total	0.0463		
Temporal Loss-Maturity <i>*Note: Period between completion of compensatory mitigation measures and the time required for maturity, as it relates to function (i.e. maturity of tree stratum to provide organic matter and detritus within riparian stream or wetland buffer corridor).</i>			
% Add. Mitigation	Temporal Loss-Maturity (Years)		
20%	15		
Sub-Total	0.154333333		
		Long-term Protection	
		% Add. Mitigation and Monitoring Period	Long-Term Protection (Years)
		0 - 5/10 Year Monitoring	101
		Sub-Total	0
PART IV - Index to Unit Score Conversion			
Final Index Score (Debit)	Linear Feet	Unit Score (Debit)	ILF Costs (Offsetting Debit Units)
0.9723	500	486.15	\$388,520.00

PART V - Comparison of Unit Scores and Projected Balance										
Final Unit Score (Debit) [No Net Loss Value]	486.15	Mitigation Existing Condition - Baseline (Credit)	859.75	Mitigation Projected at Five Years Completion (Credit)	1122.1875	Mitigation Projected at Ten Years Post Completion (Credit)	1192.25	Mitigation Projected At Maturity (Credit)	1210.0625	
FINAL PROJECTED NET BALANCE					262.4375		332.5		350.3125	

Part VI - Mitigation Considerations (Incentives)			
Extent of Stream Restoration <i>*Note1: Reference the instructional handout to determine the correct Restoration Levels (below) for your project *Note2: Place a "checkmark" in the appropriate category (only select one).</i>		Extended Upland Buffer Zone <i>*Note1: Reference instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below) *Note2: Enter the buffer width for each channel side (Left Bank and Right Bank) *Note3: Select the appropriate mitigation type</i>	
<input checked="" type="checkbox"/> Restoration Level 1	FULL EXTENT (e.g. Extensive channel restoration involving dimension, pattern and profile work through re-establishment or creation on impaired moderate and low-gradient perennial and intermittent streams)	Buffer Width	Left Bank
<input checked="" type="checkbox"/> Restoration Level 2	MODERATE EXTENT (e.g. Extensive channel restoration generally involving dimension and profile work through re-establishment or creation on impaired moderate and low-gradient perennial and intermittent streams)	100	0-50 Preservation and Re-vegetation 51-150 Preservation and Supplemental Planting
<input checked="" type="checkbox"/> Restoration Level 3	FULL EXTENT IN Laterally Contained or Limited Belt Width Channels (e.g. Channel restoration involving dimension, pattern and profile work through re-establishment or creation on impaired high, moderate and low-gradient streams)	Buffer Width	Right Bank
In the absence of a Watershed Plan, a Watershed Approach (focusing upon a 12-digit HUC watershed scale or larger) for compensatory mitigation has been applied? (Yes or No)		100	0-50 Preservation and Re-vegetation 51-150 Preservation and Supplemental Planting
<i>*Note: A watershed approach is a requirement to obtain one of the "Extent of Stream Restoration" incentives</i>		Average Buffer Width/Side	100
Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)	Straight Preservation Ratio
Labor Creek Mit Site A	486.15	490.4375	Only Active During Preservation

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: EIP TEST

Location:

Sampling Date: Enter dates on Data Form

Choose Site on Data Form Choose Timing of Data Form

Subclass for this SAR:

Select Stream Type on Data Form

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number:

Functional Results Summary:

Please Fill Out Site and Timing Information on Data Form

Function	Functional Capacity Index
Hydrology	0.77
Biogeochemical Cycling	0.67
Habitat	0.73

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	85.00	0.96
V_{EMBED}	Average embeddedness of channel.	2.00	0.46
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.25	0.13
V_{BERO}	Total percent of eroded stream channel bank.	70.00	0.70
V_{LWD}	Number of down woody stems per 100 feet of stream.	10.00	1.00
V_{TDBH}	Average dbh of trees.	14.97	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	6.00	0.70
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	6.30	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	95.00	1.00
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.93	0.98

A Breakdown of SWVM Baseline Components

- HGM
- Physical
 - ▶ USEPA RBPs
- Chemical
 - ▶ Conductivity, pH and DO
- Biological
 - ▶ WVSCI

Each of the four
Sections have been
Scaled from:
0 (poor) to 1.0 (best)



A Breakdown of SWVM Baseline Components (cont'd)

- Agency/IRT consensus on scales and weighting approach

Score	Range	Default Values	Score	Individual Percentages	Overall Percentage
HGM (Operational Draft Regional Guidebook July 2010)					
Hydrology	0-1.0	NA	Avg of FCI Scores		50%
Biogeochemical Cycling	0-1.0				
Habitat	0-1.0				
Physical Indicator					
1. Epifaunal Substrate/Available Cover	0-20	NA	0-200		33%
2. Pool Substrate Characterization	0-20				
3. Pool Variability	0-20				
4. Sediment Deposition	0-20				
5. Channel Flow Status	0-20				
6. Channel Alteration	0-20				
7. Channel Sinuosity	0-20				
8. Bank Stability (LB & RB)	0-20				
9. Vegetative Protection (LB & RB)	0-20				
10. Riparian Vegetative Zone Width (LB and RB)	0-20				
Chemical Indicator					
DO					
>5	30	Default	30	15%	50%
0-5	10				
Specific Conductivity					
0-99	90				
100-199	85	Default	85	45%	
200-299	80				
300-399	70				
400-499	60				
500-599	50				
600-749	40				
750-999	30				
1000-1499	20				
1500-2500	10				
pH					
0-3.5	0				
3.6-4.5	5				
4.6-5.5	10				
5.6-5.9	45	Default	45	40%	
6.0-8.0	80				
8.1-9.0	45				
9.1-11	10				
Biological Indicator					
100-86	1		1		33%
60.6-86	x/100		x/100		
20-60.5	(x-10)/100		(x-10)/100		
<20	0		0		

Factors and Value Components

- ▶ Temporal Loss
- ▶ Long-term Protection
- ▶ Extent of Restoration Work Incentive
- ▶ Extended Buffer Zone Width Incentive

Temporal Loss-Construction (period between impact and completion of mitigation)	
Year(s)	% Additional Mitigation (figure added to total debit)
≤ 1	0
2	6
3	9
4	12
5	15
6	18
7	21
8	24
9	27
10	30
11	33
12	36
13	39
14	42
15	45
16	48
17	51
18	54
19	57
≥ 20	60

Long-term Protection	
Year(s)	% Additional Mitigation
0-20	50% + 20 yr Monitoring
21-30	40% + 15 yr Monitoring
31-40	30% + 10 yr Monitoring
41-50	20% + 5/10 yr Monitoring
51-100	10% + 5/10 yr Monitoring
Perpetual	0% + 5/10 yr Monitoring

Temporal Loss-Maturity (period between mitigation completion and maturity)	
Year(s)	% Additional Mitigation (figure added to total debit)
<5	0%
5.1-10	10%
10.1-15	20%
15.1-19	30%

Extent of Stream Restoration - Incentive (% multiplied by projected lift and added to total)	
Level I Restoration	100%
Level II Restoration	75%
Level III Restoration	50%

Extended Stream Buffer Zone Width - Incentive (% multiplied by projected lift and added to total)	
Inner Buffer 0-100' (or 0-50'/bank)	Preservation 10%
	Preservation and Supplemental 20%
	Preservation and Revegetation 35%
Outer Buffer 101-300' (or 51-150'/bank)	Preservation 5%
	Preservation and Supplemental 10%
	Preservation and Revegetation 17.5%

Extended Wetland Buffer Zone Width - Incentive (% multiplied by projected lift and added to total)	
Inner Buffer 0-100' (or 0-50'/bank)	Preservation 5%
	Preservation and Supplemental 10%
	Preservation and Revegetation 17.5%
Outer Buffer 101-300' (or 51-150'/bank)	Preservation 2.5%
	Preservation and Supplemental 5%
	Preservation and Revegetation 8.75%

Extent of Stream Restoration

Restoration Incentive Levels	Applicable Stream Classification	Activity Types	Corresponding Priority Level	Incentive Amount
Level I	Moderate and Low-gradient (Perennial and Intermittent)	Full-extent Channel/ Habitat Restoration, Floodplain Restoration and Bank Stability	Priority 1 and Priority 2 (as deemed applicable based upon a case-by-case review)	100%
Level II	Moderate and Low-gradient (Perennial and Intermittent)	Significant Floodplain Re-establishment, Habitat Improvement & Bank Stability	Priority 2	75%
Level III	High, Moderate and Low-gradient (Perennial, Intermittent and Ephemeral)	Intensive Channel Restoration, Habitat Restoration & Bank Stability	Priority 3	50%

Caveat: A Watershed Approach (or a Watershed Plan) **based upon 12-digit HUC** shall be provided to qualify for the above incentives . Submittal criteria established in 2011 PN.



Sole Preservation (v2.1)

- Stream Preservation
 - ▶ For special aquatic sites, waters exhibiting functional importance or waters under threats and pressure
 - ▶ Stream index score correlates to Ratio Incentive
 - 1.0-0.95= 10:1
 - 0.95-0.90= 12:1
 - 0.90-0.85= 14:1
 - 0.85-0.80= 16:1



