Learning to “SWVM”

SWVM v2.1 for WVDEP

Date: August 20, 2013

US Army Corps of Engineers
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SWVM History

- SWVM v1.0
  - Released by IRT via Joint PN Feb 1, 2010
- SWVM v2.0
  - Released by IRT via Joint PN Feb 1, 2011
    - Revisions included:
      - Mitigation Site Location Data
      - Integrated HGM
      - Removal of “No Net Loss” Default
      - 10yr Column for Mitigation
      - Extent of Restoration Work Incentive
      - Buffer Zone Width Incentive
- SWVM v2.1
  - Released by IRT via Joint PN Aug 19, 2013

SWVM History

- SWVM v2.1
  - Working Draft Available Since 1 Sep 2012
  - Revisions Include:
    - Revised header on Tab 1 to indicate Stream Class and % slope
    - Capable of assessing “Sole Preservation”
    - Re-calibrated RBP values for Ephemeral Streams
    - Inserted check-boxes for stream restoration incentive levels and added IRT descriptions
    - Added 12-digit HUC Watershed Approach (trigger for obtaining any restoration incentive)
    - Added “Extended Upland Buffer Incentive” for Wetlands

Pre-SWVM Assessments:

- Assortment of individual conditional or functional assessments
  - ▸ USEPA RBPs
  - ▸ WV SCI (benthics)
  - ▸ pH
  - ▸ Conductivity
  - ▸ BEHI
  - ▸ SMCRA-related
    - Buffer Zone Analysis (BZA)
    - Cumulative Hydrologic Impact Assessment (CHIA)

Overwhelming task for PM's *to correlate individual assessment findings to form an overall condition in a consistent and timely manner*

(i.e. BPJ)

Pre-SWVM Assessments:

- Factors and Values
  - Temporal loss
  - Long-term protection (vs. perpetual)
  - Linear feet-based evaluations
    - Impact
    - Mitigation (min. 1:1 ratio)
  - Buffers
  - In-kind and out-of-kind mitigation

Determined on a case-by-case basis

Agency/IRT Evaluation Needs:

- Comprehensive metric developed with key physical, chemical and biological parameters
- Debit/Credit determination system
- Consistent plane for assessing debits/credits
- Methodology incorporating factors and values
  - Temporal Loss
  - Risk of Protection
  - Extent of Mitigation
    - Level of restoration
    - Buffer widths

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)

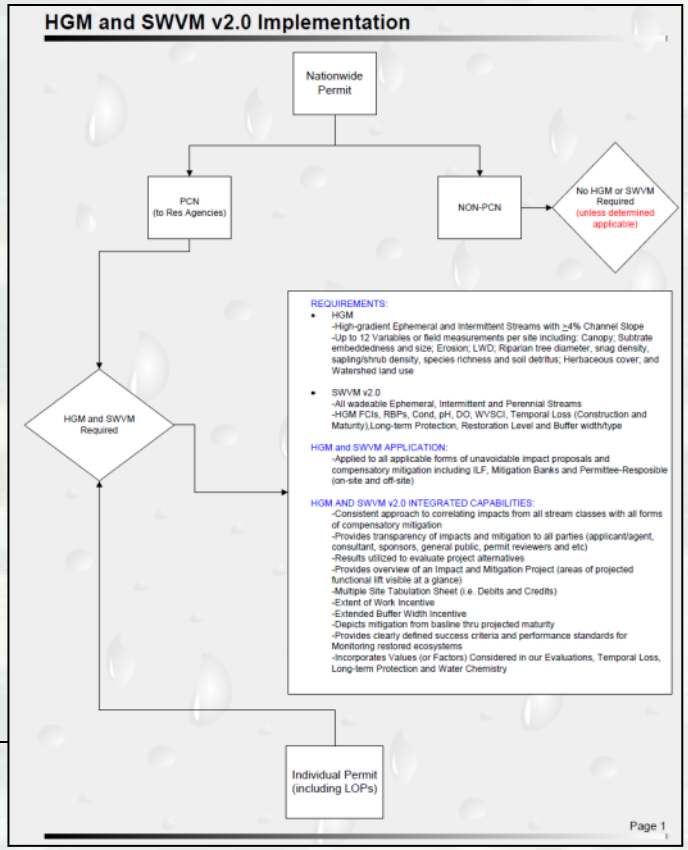
SWVM "Highly Recommended" When?

- Applications which require one of the following:

Impact Thresholds

  - PCN to the Resource Agencies (NWP)
  - Public Notice (IP)
  - Corps may also require on a case-by-case basis as deemed appropriate

- Applies to Mitigation Banks, ILF Projects as well as Permittee-Responsible Mitigation



Stream Parts I and II (Tab 1)

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

(Stream Valuation Metric - Worksheet 1 of 3)

USACE FILE NO./Project Name:	Labor Creek WV SWVM v2.1	IMPACT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		WEATHER:		DATE:	8/19/2011
IMPACT STREAM/SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)		MITIGATION STREAM CLASS./SITE ID AND SITE DESCRIPTION: (watershed size (acreage), unaltered or impairments)							Comments:	
STREAM IMPACT LENGTH:	500	FORM OF MITIGATION:	ENHANCEMENT	MIT COORDINATES: (in Decimal Degrees)	Lat.		Lon.		PRECIPITATION PAST 48 HRS:		Mitigation Length:	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		0.7	Hydrology	0.7		0.683333333	Hydrology	0.8		0.8	Hydrology	0.8		0.8	Hydrology	0.8		0.8
Biogeochemical Cycling	0.6			Biogeochemical Cycling	0.75			Biogeochemical Cycling	0.8			Biogeochemical Cycling	0.8			Biogeochemical Cycling	0.8		
Habitat	0.7			Habitat	0.6			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			
	Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score		Points Scale	Range	Site Score
PHYSICAL INDICATOR (Applies to all streams classifications)				PHYSICAL INDICATOR (Applies to all streams classifications)				PHYSICAL INDICATOR (Applies to all streams classifications)				PHYSICAL INDICATOR (Applies to all streams classifications)				PHYSICAL INDICATOR (Applies to all streams classifications)			
USEPA RBP (High Gradient Data Sheet)				USEPA RBP (High Gradient Data Sheet)				USEPA RBP (High Gradient Data Sheet)				USEPA RBP (High Gradient Data Sheet)				USEPA RBP (High Gradient Data Sheet)			
1. Epifaunal Substrate/Available Cover	0-20	0-1	20	1. Epifaunal Substrate/Available Cover	0-20	0-1	12	1. Epifaunal Substrate/Available Cover	0-20	0-1	15	1. Epifaunal Substrate/Available Cover	0-20	0-1	15	1. Epifaunal Substrate/Available Cover	0-20	0-1	18
2. Embeddedness	0-20		20	2. Embeddedness	0-20		12	2. Embeddedness	0-20		15	2. Embeddedness	0-20		15	2. Embeddedness	0-20		18
3. Velocity/ Depth Regime	0-20		20	3. Velocity/ Depth Regime	0-20		12	3. Velocity/ Depth Regime	0-20		15	3. Velocity/ Depth Regime	0-20		15	3. Velocity/ Depth Regime	0-20		18
4. Sediment Deposition	0-20		18	4. Sediment Deposition	0-20		12	4. Sediment Deposition	0-20		15	4. Sediment Deposition	0-20		15	4. Sediment Deposition	0-20		18
5. Channel Flow Status	0-20		18	5. Channel Flow Status	0-20		12	5. Channel Flow Status	0-20		15	5. Channel Flow Status	0-20		15	5. Channel Flow Status	0-20		18
6. Channel Alteration	0-20		18	6. Channel Alteration	0-20		12	6. Channel Alteration	0-20		15	6. Channel Alteration	0-20		15	6. Channel Alteration	0-20		18
7. Frequency of Riffles (or bends)	0-20		18	7. Frequency of Riffles (or bends)	0-20		12	7. Frequency of Riffles (or bends)	0-20		15	7. Frequency of Riffles (or bends)	0-20		15	7. Frequency of Riffles (or bends)	0-20		18
8. Bank Stability (LB & RB)	0-20		18	8. Bank Stability (LB & RB)	0-20		8	8. Bank Stability (LB & RB)	0-20		15	8. Bank Stability (LB & RB)	0-20		15	8. Bank Stability (LB & RB)	0-20		18
9. Vegetative Protection (LB & RB)	0-20		18	9. Vegetative Protection (LB & RB)	0-20		6	9. Vegetative Protection (LB & RB)	0-20		15	9. Vegetative Protection (LB & RB)	0-20		20	9. Vegetative Protection (LB & RB)	0-20		20
10. Riparian Vegetative Zone Width (LB & RB)	0-20		18	10. Riparian Vegetative Zone Width (LB & RB)	0-20		6	10. Riparian Vegetative Zone Width (LB & RB)	0-20		15	10. Riparian Vegetative Zone Width (LB & RB)	0-20		20	10. Riparian Vegetative Zone Width (LB & RB)	0-20		20
Total RBP Score	Optimal		186	Total RBP Score	Marginal		104	Total RBP Score	Suboptimal		150	Total RBP Score	Optimal		169	Total RBP Score	Optimal		184
Sub-Total			0.93	Sub-Total			0.52	Sub-Total			0.75	Sub-Total			0.845	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)			
WVDEP Water Quality Indicators (General)				WVDEP Water Quality Indicators (General)				WVDEP Water Quality Indicators (General)				WVDEP Water Quality Indicators (General)				WVDEP Water Quality Indicators (General)			
Specific Conductivity				Specific Conductivity				Specific Conductivity				Specific Conductivity				Specific Conductivity			
100-199 = 85 points	0-90	0-1	190	300-399 = 70 points	0-90	0-1	375	200-299 = 80 points	0-90	0-1	250	200-299 = 80 points	0-90	0-1	200	200-299 = 80 points	0-90	0-1	200
pH				pH				pH				pH				pH			
5.6-5.9 = 45 points	0-90		5.6	4.6-5.5 = 10 points	0-90		5.1	5.6-5.9 = 45 points	0-90		5.6	5.6-5.9 = 45 points	0-90		5.6	5.6-5.9 = 45 points	0-90		5.6
DO				DO				DO				DO				DO			
>5.0 = 30 points	10-30		5	>5.0 = 30 points	10-30		5	>5.0 = 30 points	10-30		5	>5.0 = 30 points	10-30		5	>5.0 = 30 points	10-30		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	0-1	80	Fair	0-100	0-1	60	Very Good	0-100	0-1	80	Very Good	0-100	0-1	86	Very Good	0-100	0-1	86
Sub-Total			0.8	Sub-Total			0.5	Sub-Total			0.8	Sub-Total			1	Sub-Total			1

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0.772	500	385.833333

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0.603333333	1425	859.75

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0.7875	1425	1122.1875

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0.836666667	1425	1192.25

PART II - Index and Unit Score		
Index	Linear Feet	Unit Score
0.849166667	1425	1210.0625

Impact

Baseline Mitigation

Mitigation Projected at 5 yrs

Mitigation Projected at 10 yrs

Mitigation Projected Maturity

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

**Note: Reflects duration of aquatic functional loss between the time of an impact (debit) and completion of compensatory mitigation (credit).*

Years	2
Sub-Total	0.0463

Temporal Loss-Maturity

**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).*

% 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	$388,920.00

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 Post 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

**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).*

☐ 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)
☐ 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)
☐ 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)

Extended Upland Buffer Zone

**Note[1]: Reference instructional handout for the definitions of the Buffer Zone Mitigation Extents and Types (below)*
**Note[2]: Enter the buffer width for each channel side (Left Bank and Right Bank)*
**Note[3]: Select the appropriate mitigation type*

Buffer Width	Left Bank	
100	0-50	Preservation and Re-vegetation
	51-150	Preservation and Supplemental Planting
Buffer Width	**Right Bank**	
100	0-50	Preservation and Re-vegetation
	51-150	Preservation and Supplemental Planting
Average Buffer Width/Side	100	

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)** **Note: A watershed approach is a requirement to obtain one of the "Extent of Stream Restoration" incentives*	N

Site	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)
Labor Creek Mit Site A	486.15	490.4375

Straight Preservation Ratio
Only Active During Preservation

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					33%
>5	30	Default	30	**15%**	
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					50%
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

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%**

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

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 corrleates 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

SWVM Data Entry ~ Multiple Site Unit Comparison Tab

- What does this all mean?
  - Mitigation (or credits)= 489.2
  - Impacts (or debits)= 486.15

West Virginia Stream and Wetland Valuation Metric (SWVM)

(Stream Valuation Metric - Worksheet 3 of 3)

Multiple Stream Site Unit Comparison				
Site	**Impact Unit Yield (Debit)**	**Mitigation Unit Yield (Credit)**	**Sub-Totals**	**Running Balance (Debit or Credit)**
Labor Creek Mit Site A	486.15	235.4	-250.75	-250.75
Smith Creek Mit Site 1	0	98.5	98.5	-152.25
Smith Creek Mit Site 2	0	155.3	155.3	3.05
			0	3.05
			0	3.05
			0	3.05
			0	3.05
			0	3.05
			0	3.05
			0	3.05
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			0	3.05
			0	3.05
			0	3.05
			0	3.05
Sub-Totals	**486.15**	**489.2**		3.05
TOTAL NET				

The “Future”

- HGM (Eph & Int Streams)
  - Under concurrent use and approaching end of 2 year validation process (currently evaluating comments)
  - Potentially calibrated for adjacent Corps Districts
- HGM (Perennial Streams)
  - Initial data collection effort completed
  - Additional data collection and validation has begun
- WV SWVM
  - Expand for fishery IBI (once completed) for perennial low-gradient stream impacts and mitigation

The “Dream Machine”

- HGM Post Validation
  - **Component A** – HGM Guidebook for High-gradient Streams
    - Eph and Int Streams
    - Perennial Streams
  - **Component B** – Factors and Value Components
    - Temporal Loss
    - Long-term Protection
    - Water Chemistry (i.e. IBI’s)
    - Mitigation Work Extent Incentive
    - Extended Buffer Incentive

Thank You…

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The WV SWVM and Instructions are available at:

http://www.lrh.usace.army.mil/Missions/Regulatory/Mitigation.aspx