APPENDIX 10: MITIGATION METRICS AND PERFORMANCE STANDARDS

1. Introduction.

The following recommended monitoring metrics and performance standards have been developed to correlate with stream and wetland mitigation bank objectives. An illustrative list of potential mitigation bank objectives is presented in Sections 6.1.8 and 6.1.9. For each bank proposal, the sponsor with the support of the IRT shall identify specific bank objectives. These objectives will be used to further define the baseline surveys and monitoring variables. The results will be used below to determine overall success and support credit releases.

2. Monitoring Metrics and Performance Standards.

Each approved bank will have monitoring requirements, and these requirements will be based on the objectives. As displayed below, there are three overarching monitoring metrics for each resource category. For streams, metrics will assess physical, chemical and biological factors. For wetlands, metrics will assess buffer, abiotic, and biotic factors. Success for each variable will be measured based upon a pass/fail approach. The percentage of variables (of each factor) with a passing score will be used to determine if the mitigation bank has met the performance standards required for annual success credit releases.

In order to achieve a credit release for a stream or wetland mitigation bank, the cumulative score must minimally achieve a total mean score of 60% for the three factors. If this minimum score is not obtained in any one year, no credits will be released. If the total mean score is between 60 and 79%, the USACE may release 50% of the total credits scheduled for release during that monitoring period. Providing site adjustments are made and new performance metrics achieved, credits withheld from release may be available the following year. If the total mean score is between 80 and 100%, the USACE may release 100% of the total credits scheduled for release during that monitoring period.

For a mitigation bank that is comprised of both stream and wetland credits, if the total individual mean score for one or both (i.e., stream and/or wetland) achieves a credit release of 50%, then the total credits released for both stream and wetland would not be greater than 50%. If the total individual mean score for both (i.e., stream and wetland) achieve 80% respectively, then the total credit release for both stream and wetland would be 100%. If the total individual mean score for either one of both (i.e., stream and/or wetland) achieve less that 60%, then there would be no stream or wetland credit release for that monitoring period.

Monitoring station data will be used to determine if a variable receives a passing (+) or failing (-) grade. Each monitoring station for a variable will be used to represent a percentage of the total credits (stream or wetland) generated for the mitigation bank. The data from each monitoring station will be assessed collectively to determine success. In order to achieve a passing grade for a monitoring variable, data representing 80% of the total credits generated must pass the interim or final success criteria. Data assimilation and credit release examples are provided in Figures 1 through 6 (these figures can be found in Section 3 of this document).

2.1 Stream Monitoring Metrics.

For streams, metrics will assess physical, chemical and biological factors. Physical variables include: Channel Dimension; Channel Pattern and Profile; and, Streambank Stability and Nearbank Stress. For this factor (i.e. Physical), all variables must be passed to obtain a potential stream credit release. Chemical variables include: Temperature; Dissolved Oxygen or Biochemical Oxygen Demand; pH; and, Total Suspended Solids. Biological variables include: Riparian Vegetative Survival and Growth; Riparian Vegetative Structure; Fish Index of Biotic Integrity; Macro-invertebrate Site Index; and, Physical Habitat Assessment. Although the core variables that are recommended for monitoring along with their performance standards are presented in the following tables, the IRT shall determine on a case by case evaluation of the proposed bank objectives if all metric variables are appropriate. Additional supplementary variables may be applicable and used as appropriate. Examples are presented in the tables below.

STREAM METRICS: PHYSICAL			
Variables	**Interim and Final Success Criteria**	**SCORE (+/-)**	**TOTAL (%)**
Channel Dimension	Priority 1, 2 & 3 Channel Restoration: Geomorphic dimension exhibits max/min design range (in table below) as compared to the as-built survey, unless sponsor documents the reach has a stable dimension. Priority 4 Channel Restoration, Structure Removal, and Channel Preservation: Geomorphic dimension remains within measured baseline or max/min design ranges (in table below), if applicable. Channel exhibits no headcuts or bank failures, and all vanes, revetments, root wads, and other bank stabilizing structures are intact and functioning.		
Channel Pattern and Profile	Priority 1, 2, and 3 Channel Restoration: Channel pattern and profile survey exhibits appropriate max/min design ranges (in table below) as compared to the as-built survey, unless sponsor documents the reach has a stable pattern and profile. . Priority 4 Channel Restoration, Structure Removal, and Channel Preservation: A stable channel pattern and profile exist as compared to baseline.		
Streambank Stability and Nearbank Stress	Streambanks are stable, excluding normal underbank cutting. ➢ As measured by Bank Erosion Hazard Index		
	TOTALS		
*In order to get **ANY** stream credit release, a (+) score must be achieved for all variables.*			

Table: Geomorphic Variables

Parameter	Restoration Type Required	Value			Units
		Design Parameters (Max/Min)	As-Built	Monitoring Year(s)	
Rosgen Stream Type	P1, P2, P3, P4				
Bankfull Width (W_{bkf})	P1, P2, P3, P4				Feet
Bankfull Mean Depth (d_{bkf})	P1, P2, P3, P4				Feet
Cross-Sectional Area (A_{bkf})	P1, P2, P3, P4				Square Feet
Width/Depth Ratio (W/D ratio)	P1, P2, P3, P4				
Bankfull Max Depth (d_{mbkf})	P1, P2, P3, P4				Feet
Floodprone Area Width (W_{fpa})	P1, P2, P3, P4				Feet
Bank Height Ratio (BHR)	P1, P2, P3, P4				
Entrenchment Ratio (ER)	P1, P2, P3, P4				
Max Pool Depth	P1, P2, P3, P4				Feet
Pool Width	P1, P2, P3				Feet
Pool to Pool spacing	P1, P2, P3				Feet
Channel Materials (Particle Size Index)	P1, P2, P3, P4				
d_{16}					mm
d_{35}					mm
d_{50}					mm
d_{84}					mm
d_{95}					mm
D_{100}					mm
Slope (S)	P1, P2, P3				Feet per foot
Channel Sinuosity (K)	P1, P2, P3				

Radius of Curvature	P1, P2, P3				
Note: Specific variables will be determined on a case by case evaluation with the IRT and the Bank Sponsor.					

STREAM METRICS: CHEMICAL			
Variables	**Interim and Final Success Criteria**	**SCORE (+/-)**	**TOTAL (%)**
Temperature	Temp: • < 90ºF (32ºC) for warm water streams • Anti-degradation of cold water (trout) streams *If stream temperature exceeds the above success criteria, the applicant must demonstrate that the failure was attributed to changing conditions in the watershed outside of their control. The applicant would need to demonstrate that stream temperature was not greater than background (i.e., stream flow entering the mitigation bank) at any sampling point within the mitigation stream reach.		
Dissolved Oxygen (DO) **or** Biochemical Oxygen Demand (BOD)	DO: • $\geq$ 4 mg/l for warm water streams (with the exception of some coastal plain streams, which naturally have lower DO conditions) • $\geq$ 5 mg/l for cold water (trout) streams BOD: • 1-4 mg/l 5-day carbonaceous BOD *If stream DO or BOD exceeds the above success criteria, the applicant must demonstrate that the failure was attributed to changing conditions in the watershed outside of their control. The applicant would need to demonstrate that stream DO or BOD was not greater than background (i.e., stream flow entering the mitigation bank) at any sampling point within the mitigation stream reach.		
pH	6.0-8.5 (with the exception of black water streams, which have more naturally occurring acidic conditions) *If stream pH exceeds the above success criteria, the applicant must demonstrate that the failure was attributed to changing conditions in the watershed outside of their control. The applicant would need to demonstrate that stream pH was not greater than background (i.e., stream flow entering the mitigation bank) at any sampling point within the mitigation stream reach.		
Total Suspended Solids (TSS)	TSS: • $\leq$ 10 NTU at baseflow sampling (above background) • $\leq$ 50 NTU at storm sampling (above background)		

Supplementary Monitoring Variables	*Additional monitoring variables can be proposed to demonstrate stream chemical success (see the supplementary chemical variable list below). If an additional variable is proposed, the score of that variable will be weighted equally (50%) to the four core variables (50% collectively). If two additional variables are proposed, the scores of those variables will be weighted equally (33% each) to the four core variables (33% collectively).		
		TOTALS	

*Baseflow and storm baseline sampling at the Prospectus stage of the stream mitigation bank is recommended. In addition to the four core chemical variables listed above, if warranted, the IRT may suggest additional chemical variables be included in the chemical baseline data collection plan at the Draft Prospectus IRT meeting. The addition of supplementary chemical variables would be based upon a reason to believe that the restoration reach(es) may be impaired due to known or potentially viable source of contamination. A review of the surrounding land use (i.e., past 50 years) of the mitigation bank site and existing watershed would be part of the determination for additional chemical variables. If all of the variables in the chemical baseline data collection plan (in both baseflow and storm sampling) fall within the acceptable ranges, then the above four core chemical variables are recommended for chemical data collection in baseflow conditions (i.e., no sampling within 5 days of a storm event) throughout the monitoring period. However, if any of the chemical variables fall outside of the acceptable ranges during baseline sampling, then both baseflow and storm sampling would be additionally recommended for those problem chemical variables throughout the monitoring period *The above standards have been developed in accordance with the State of Georgia Water Quality Standards. These standards may be modified during the development of the pending revision to the Standard Operating Procedure for Compensatory Mitigation.*

Supplementary Variables: Temperature, DO/BOD, and PH enhancements; Ortho-Phosphate; Dissolved Oxygen for Sensitive Species - $\geq$ 7 mg/l; Nitrates; Nitrites; Salinity; Ammonia; Fecal Coliform; Aluminum; Antimony; Arsenic; Barium; Beryllium; Cadmium; Chromium; Copper, HEM (Oil & Grease), Iron, Lead, Manganese, Mercury, Organic Carbon, Selenium, Silver, Semi-volative Organic Compounds, Thallium, Zinc, Conductivity, Hardness, and/or other pollutants (i.e., pollutants on EPA's Priority Pollutant List)

STREAM METRICS: BIOLOGICAL				
Variables	**Final Success Criteria**	**Interim Success Criteria**	**SCORE (+/-)**	**TOTAL (%)**
Riparian Vegetation Survival and Growth	Restoration: 150 planted stems (bare root trees and shrubs) per acre. Growth: Trees must have tripled in height and crown diameter compared to size at Year 0 (Based on planting density at Year 0 of 435 stems/acre). *Containerized planting growth requirements would be based upon a case by case basis. Volunteer stems can be counted toward targeted criteria if they (1) will produce seeds or fruit useful as wildlife food at maturity, (2) are of equitable size as planted stems at the time success is evaluated, and (3) coincide with desired native species composition.	Survival: 350 stems/A @Year 1 310 stems/A @Year 2 270 stems/A @Year 3 240 stems/A @Year 4 210 stems/A @Year 5 180 stems/A @Year 6 **or** Maintain 150 stems/A through Years 1 – 6. Growth: Trees must have doubled in height and crown diameter at Year 4.		

	Preservation: Sustain existing basal area within 90% of baseline of mature trees present at Year 0	Same as final criteria		
Riparian Vegetation Structure	Restoration: 1. Diverse vegetation with no 2 dominant species (with the exception of special habitat types – e.g. Cypress buffers) 2. <5% of stems are non-native woody species (with the exception of Chinese privet, where the stem limits must not exceed 25% unless other conditions would justify further reduction) 3. >60% of stems produce hard or soft mast 4. 25-40% of stems are native shrub species Based on stems counted to evaluate survival/growth Preservation: Sustain existing riparian vegetative structure (i.e., dominant species, percent of non-native species, percent of hard and soft mast stems, and percent of native shrubs).	Same as final criteria Same as final criteria		
Fish Index of Biotic Integrity (IBI) * Not applicable for 1st and 2nd order streams with watersheds ≤ 1 square mile in size.	Restoration: For baseline IBI scores falling in the Very Poor, Poor, and Fair Integrity Classes, the Site Index score at Year 7 must be 15% over baseline. For baseline IBI scores falling in the Good Integrity Class, the Site Index score at Year 7 must be 10% over baseline. For baseline IBI scores falling in the Excellent Integrity Class, the Site Index score at Year 7 must increase over baseline.	No sampling in Years 1, 2, 4, and 6 For baseline IBI scores falling in the Very Poor, Poor, or Fair Integrity Classes, the Site Index score must increase over baseline: 5% @ Year 3 10% @ Year 5 For baseline IBI scores falling in the Good Integrity Class, the Site Index score must increase over baseline: 3% @ Year 3 5% @ Year 5 For baseline IBI scores falling in the Excellent Integrity Class, the Site Index score must increase		

		over baseline for Years 3 and 5.		
	<u>Preservation</u>: Sustain IBI score in preservation reaches. ➢ As measured by the Standard Operating Procedure for Conducting Monitoring on Fish Communities in Wadeable Streams in Georgia. ➢ The above methodology is not applicable for streams with known populations of federally listed threatened and endangered fish species.	Same as final criteria		
Macro-invertebrate Site Index * Applicable to all stream orders	<u>Restoration</u>: For baseline Site Index scores falling in the Very Poor, Poor, and Fair Rankings, the Site Index score at Year 7 must be 15% over baseline. For baseline Site Index scores falling in the Good Ranking, the Site Index score at Year 7 must be 10% over baseline. For baseline Site Index scores falling in the Excellent Ranking, the Site Index score at Year 7 must increase over baseline. <u>Preservation</u>: Sustain Site Index score in preservation reaches. ➢ As measured by the Georgia Macro-invertebrate Biological	Yearly sampling is required For baseline Site Index scores falling in the Very Poor, Poor, or Fair Rankings, the Site Index score must increase over baseline: 10% @ Year 1 5% @ Year 3 10% @ Year 5 For baseline Site Index scores falling in the Good Ranking, the Site Index score must increase over baseline: 5% @ Year 1 3% @ Year 3 5% @ Year 5 For baseline Site Index scores falling in the Excellent Ranking, the Site Index score must increase over baseline for Years 1, 3, and 5. Same as final criteria		

Physical Habitat Assessment	<u>Restoration</u>: Increase of the Physical Habitat score over baseline. *For streams designed to have a median substrate particle size of gravel or larger (e.g., Rosgen type C4 or E4), the embeddedness parameter within the Physical Habitat Assessment must achieve a score of suboptimal or higher. <u>Preservation</u>: Sustain the Physical Habitat Assessment score (and embeddedness score, where appropriate) in preservation reaches. ➢ As measured by the Physical Habitat Assessment Methodology outlined in the Georgia Macro-invertebrate Biological Assessment of Wadeable Streams in Georgia.	Same as final criteria Same as final criteria		
Supplementary Monitoring Variables	*Additional monitoring variables can be proposed to demonstrate stream biological success.			
		TOTALS		
Supplementary Variables: GADNR Fish Index of Well Being (IWB), Federally Listed Threatened & Endangered Species Abundance, State Listed Rare & Endangered Species Abundance, Native Crayfish Abundance, Native Crayfish Diversity, Native Mollusk Abundance, Native Mollusk Diversity, Podostemum Coverage, Percent Canopy Cover of Riparian Vegetation, Percent Absolute Cover of Riparian Vegetation, Wildlife Utilization of Buffer				

STREAM PERFORMANCE STANDARDS SUMMARY	%
PHYSICAL SCORE	
CHEMICAL SCORE	
BIOLOGICAL SCORE	
TOTAL MEAN SCORE	
In order to achieve a credit release, the cumulative score must minimally achieve a total mean score of 60%. If this minimum score is not obtained in any one year, no credits will be released. If the total mean score is between 60 and 79%, the USACE may release 50% of the total credits scheduled for release during that monitoring period. Providing site adjustments have been made and performance increases, credits withheld from release may be available the following year. If the total mean score is between 80 and 100%, the USACE may release 100% of the total credits scheduled for release during that monitoring period.	

2.2 Wetland Monitoring Variables.

For wetlands, metrics will assess buffer, abiotic, and biotic factors. Buffer variables include: Buffer Vegetation and Survival Growth; Buffer Vegetative Structure; and, Percent Cover of Herbaceous Layer

and Litter. Abiotic variables include: Development of Hydric Soil Conditions; and, Hydrologic Regime. For this factor (i.e., Abiotic), all variables must be passed to obtain a potential wetland credit release. Biotic variables include: Wetland Vegetation and Survival Growth; Wetland Vegetative Structure; Development of Vascular Hydrophytic Vegetation; Functional Assessment; and, Native Amphibian Richness and Abundance. Although the core variables that are recommended for monitoring along with their performance standards as presented in the following tables, the IRT shall determine on a case by case evaluation of the proposed bank objectives if all metrics are appropriate. Additional supplementary variables may be applicable and used as appropriate. Examples are presented in the tables below.

WETLAND METRICS: BUFFER				
Variables	**Final Success Criteria**	**Interim Success Criteria**	**SCORE (+/-)**	**TOTAL (%)**
Buffer Vegetation and Survival Growth	Restoration: 150 planted stems (bare root trees and shrubs) per acre. Growth: Trees must have tripled in height and crown diameter compared to size at Year 0 (Based on planting density at Year 0 of 435 stems/acre). *Containerized planting growth requirements would be based upon a case by case basis. Volunteer stems can be counted toward targeted criteria if they (1) will produce seeds or fruit useful as wildlife food at maturity, (2) are of equitable size as planted stems at the time success is evaluated, and (3) coincide with desired native species composition. Preservation: Sustain the existing basal area within 90% of baseline of mature trees present at Year 0.	Survival: 350 stems/A @Year 1 310 stems/A @Year 2 270 stems/A @Year 3 240 stems/A @Year 4 210 stems/A @Year 5 180 stems/A @Year 6 **or** Maintain 150 stems/A through Years 1 – 6. Growth: Trees must have doubled in height and crown diameter at Year 4. Same as final criteria		
Buffer Vegetation Structure	Restoration: 1. Diverse vegetation with no 2 dominant species (with the exception of special habitat types – e.g. Cypress buffers) 2. <5% of stems are non-native woody species (with the exception of Chinese privet, where the stem limits must not exceed 25% unless other conditions would justify further reduction) 3. >60% of stems produce hard or soft mast	Same as final criteria		

	4. 25-40% of stems are native shrub species Based on stems counted to evaluate survival/growth <u>Preservation</u>: Sustain the existing riparian vegetative structure (i.e., dominant species, percent of non-native species, percent of hard and soft mast stems, and percent of native shrubs).	Same as final criteria		
Percent Cover of Herbaceous Layer and Litter	<u>Restoration</u>: Increase the percent cover of the herbaceous layer and litter in buffer restoration areas, compared to percent cover of herbaceous layer and litter from baseline. <u>Preservation</u>: Sustain ≥ 90% of percent cover of the herbaceous layer and litter at baseline.	Same as final criteria Same as final criteria		
Supplementary Monitoring Variables	* Additional monitoring variables can be proposed to demonstrate wetland landscape context.			
		TOTALS		
Supplementary Variables: Percent Canopy Cover of Buffer Vegetation, Percent Absolute Cover of Buffer Vegetation, Percent Cover of Non-Native Herbaceous Layer, Native Amphibian Richness, Native Amphibians Diversity, Native Reptilian Richness, Native Reptilian Diversity, Native Avian Richness, Native Avian Diversity, Wildlife Utilization				

WETLAND METRICS: ABIOTIC				
Variables	**Final Success Criteria**	**Interim Success Criteria**	**SCORE (+/-)**	**TOTAL (%)**
Development of Hydric Soil Conditions	<u>Restoration and Preservation</u>: Soils must meet hydric soils criterion outlined in the 1987 Wetland Delineation Manual and/or the appropriate Regional Supplement.	If hydric soils are not document during the baseline delineation, at minimum, the water table must be 12 inches or less from the surface, for 14 or more consecutive days during the growing season. If this condition occurs at least 50 percent of the time (i.e., 1 out of 2 years, or 4 out of 7 years) during the monitoring period, then hydric soil conditions are considered present.		
Hydrologic Regime	<u>Restoration</u>: Must be within 25% of reference hydrology conditions and/or	Same as final criteria		

	design standards for duration, degree, and frequency. *Hydrology conditions may exceed the reference condition or design standards in wetland restoration, if there are no significant vegetative community changes. If wetter conditions exist, a surrogate variable to replace Increase Hydrology will be implemented (see the surrogate variable listed below). Preservation: Sustain hydrology conditions as compared to baseline. ➢ Hydrology must meet the minimal requirements outlined in the 1987 Wetland Delineation Manual and/or the appropriate Regional Supplement to pass this variable.	Same as final criteria		
		TOTALS		
Surrogate Hydrology Variable: Herbaceous Vegetative Community Change				
*In order to get **ANY** wetland credit release, a (+) score must be achieved for both variables.*				

WETLAND METRICS: BIOTIC				
Factors	**Final Success Criteria**	**Interim Success Criteria**	**SCORE (+/-)**	**TOTAL (%)**
Wetland Vegetation Survival and Growth	Restoration: 150 planted stems (bare root trees and shrubs) per acre. Growth: Trees must have tripled in height and crown diameter compared to size at Year 0 (Based on planting density at Year 0 of 435 stems/acre). *Containerized planting growth requirements would be based upon a case by case basis. Volunteer stems can be counted toward targeted criteria if they (1) will produce seeds or fruit useful as wildlife food at maturity, (2) are of equitable size as planted stems at the time success is evaluated, and (3) coincide with desired native species composition. Preservation: Sustain existing basal area within 90% of baseline of mature trees present at Year 0.	Survival: 350 stems/A @Year 1 310 stems/A @Year 2 270 stems/A @Year 3 240 stems/A @Year 4 210 stems/A @Year 5 180 stems/A @Year 6 **or** Maintain 150 stems/A through Years 1 – 6. Growth: Trees must have doubled in height and crown diameter at Year 4. Same as final criteria		

Wetland Vegetation Structure	Restoration: 1. Diverse vegetation with no 2 dominant species (with the exception of special habitat types – e.g. Cypress swamps) 2. <5% of stems are non-native woody species (with the exception of Chinese privet, where the stem limits must not exceed 25% unless other conditions would justify further reduction) 3. >60% of stems produce hard or soft mast 4. 25-40% of stems are native shrub species Based on stems counted to evaluate survival/growth Preservation: Sustain existing riparian vegetative structure (i.e., dominant species, percent of non-native species, percent of hard and soft mast stems, and percent of native shrubs).	Same as final criteria Same as final criteria		
Development of Vascular Hydrophytic Vegetation	Plant community meets the hydrophytic vegetation criterion outlined in the 1987 Wetland Delineation Manual and appropriate Regional Supplements.	Same as final criteria		
Functional Assessment	Restoration: Increase the functional assessment score over baseline. Preservation: Sustain the functional assessment score in preservation areas, compared to baseline.	Same as final criteria Same as final criteria		
Native Amphibian Richness and Abundance	Restoration: Increase the richness and abundance in restoration areas over baseline. Preservation: Sustain the richness and abundance in preservation areas, compared to baseline.	Same as final criteria Same as final criteria		
Supplementary Monitoring Variables	* Additional monitoring variables can be proposed to demonstrate wetland biological success.			
		TOTALS		
Supplementary Variables: Percent Canopy Cover of Wetland Vegetation, Percent Absolute Cover of Wetland Vegetation, Percent Cover of Native Wetland Herbaceous Layer, Percent Cover of Non-Native Herbaceous Layer, Accumulation of Biomass/Litter Cover, Federally Listed Threatened & Endangered Species Abundance, State Listed Rare & Endangered Species Abundance, Native Reptilian Richness, Native Reptilian Diversity, Native Avian Richness, Native Avian Diversity				

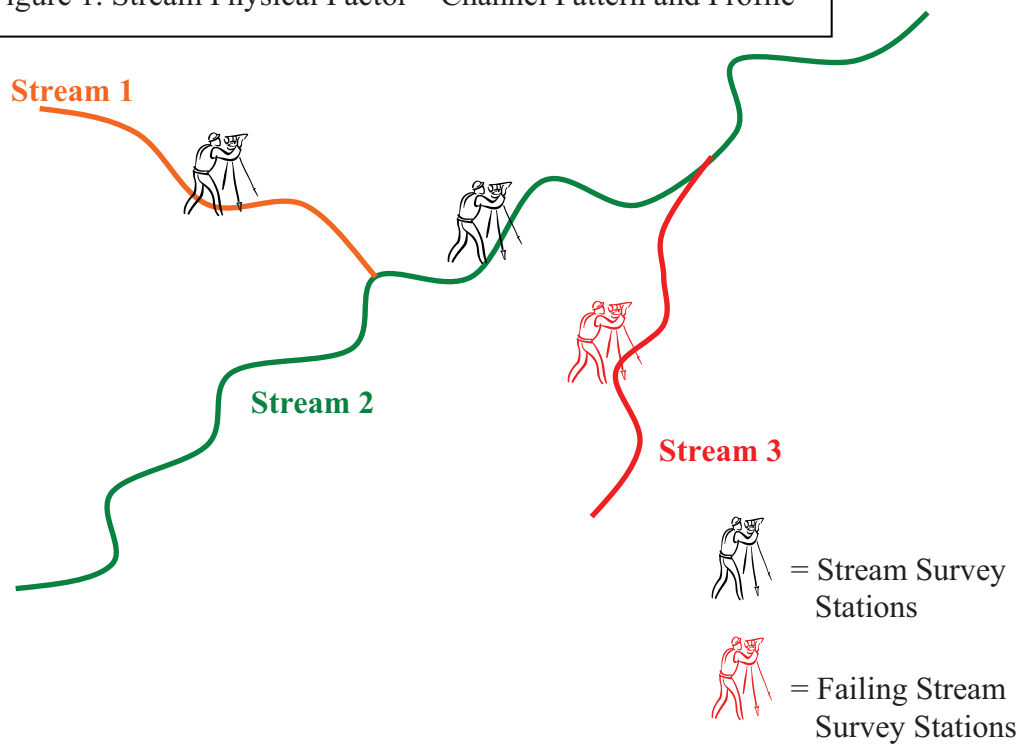
WETLAND PERFORMANCE STANDARDS SUMMARY	%
BUFFER SCORE	
ABIOTIC SCORE	
BIOTIC SCORE	
TOTAL MEAN SCORE	

In order to achieve a credit release, the cumulative score must minimally achieve a total mean score of 60%. If this minimum score is not obtained in any one year, no credits will be released. If the total mean score is between 60 and 79%, the USACE may release 50% of the total credits scheduled for release during that monitoring period. Providing site adjustments have been made and performance increases, credits withheld from release may be available the following year. If the total mean score is between 80 and 100%, the USACE may release 100% of the total credits scheduled for release during that monitoring period.

3. Data Assimilation and Credit Release Examples.

Example 1: Figures 1 through 3 are examples of stream data assimilation for individual stream variables. A Stream Performance Standards Summary for Example 1 can be found following Figure 3.

Figure 1. Stream Physical Factor – Channel Pattern and Profile



Description of Stream Credit Generation:
Stream 1 – This stream is scheduled to generate 2,000 stream credits (associated with both in-stream and riparian buffer activities).

Stream 2 – This stream is scheduled to generate 7,000 stream credits (associated with both in-stream and riparian buffer activities).

Stream 3 – This stream is scheduled to generate 1,000 stream credits (associated with both in-stream and riparian buffer activities).

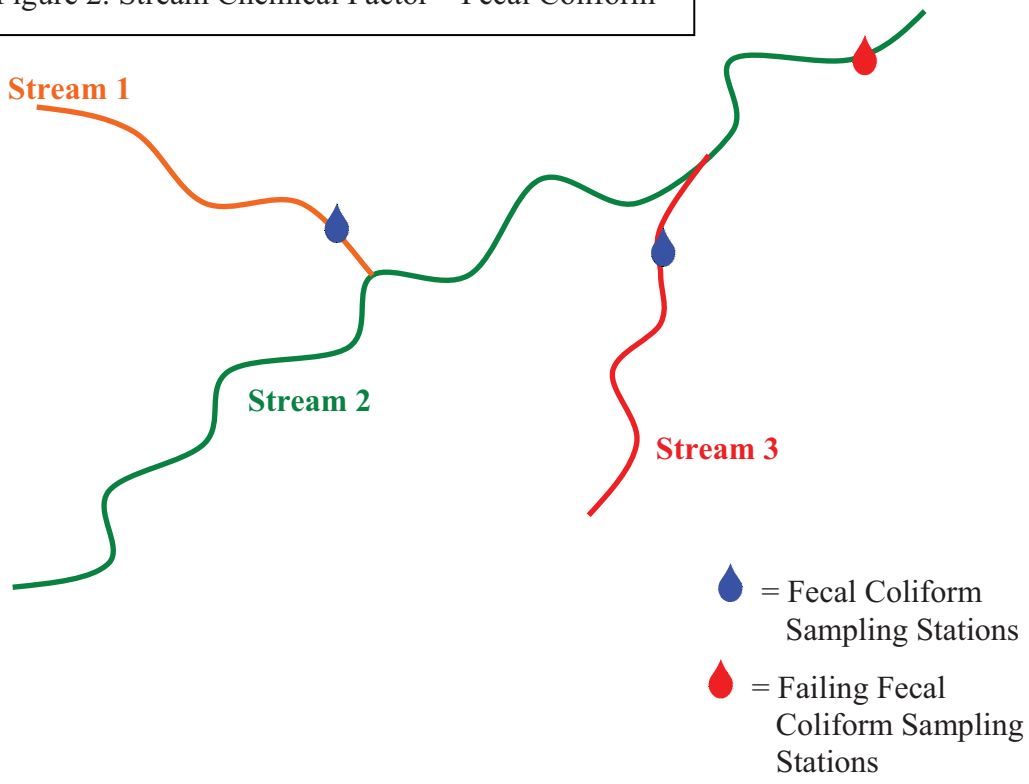
Data Assimilation Example:
Based upon the total credits generated by **Stream 1**, it represents 20% of the total stream credits generated for the mitigation bank. In accordance with the success criteria (design parameters) set for Channel Pattern and Profile, the monitoring station within **Stream 1** met the performance standard.

Based upon the total credits generated by **Stream 2**, it represents 70% of the total stream credits generated for the mitigation bank. In accordance with the success criteria (design parameters) set for Channel Pattern and Profile, the monitoring station within **Stream 2** met the performance standard.

Based upon the total credits generated by **Stream 3**, it represents 10% of the total stream credits generated for the mitigation bank. In accordance with the success criteria (design parameters) set for Channel Pattern and Profile, the monitoring station within **Stream 3** failed the performance standard.

Total Variable Score:
Based upon the above example, the Channel Pattern and Profile variable score is **90% (Stream 1 (20%) + Stream 2 (70%) + Stream 3 (0%) = 90%)**. The achievement of a total variable score of 80% to 100% would result in a passing score "+" for the variable.

Figure 2. Stream Chemical Factor – Fecal Coliform



Description of Stream Credit Generation:
Stream 1 – This stream is scheduled to generate 2,000 stream credits (associated with both in-stream and riparian buffer activities).

Stream 2 – This stream is scheduled to generate 7,000 stream credits (associated with both in-stream and riparian buffer activities).

Stream 3 – This stream is scheduled to generate 1,000 stream credits (associated with both in-stream and riparian buffer activities).

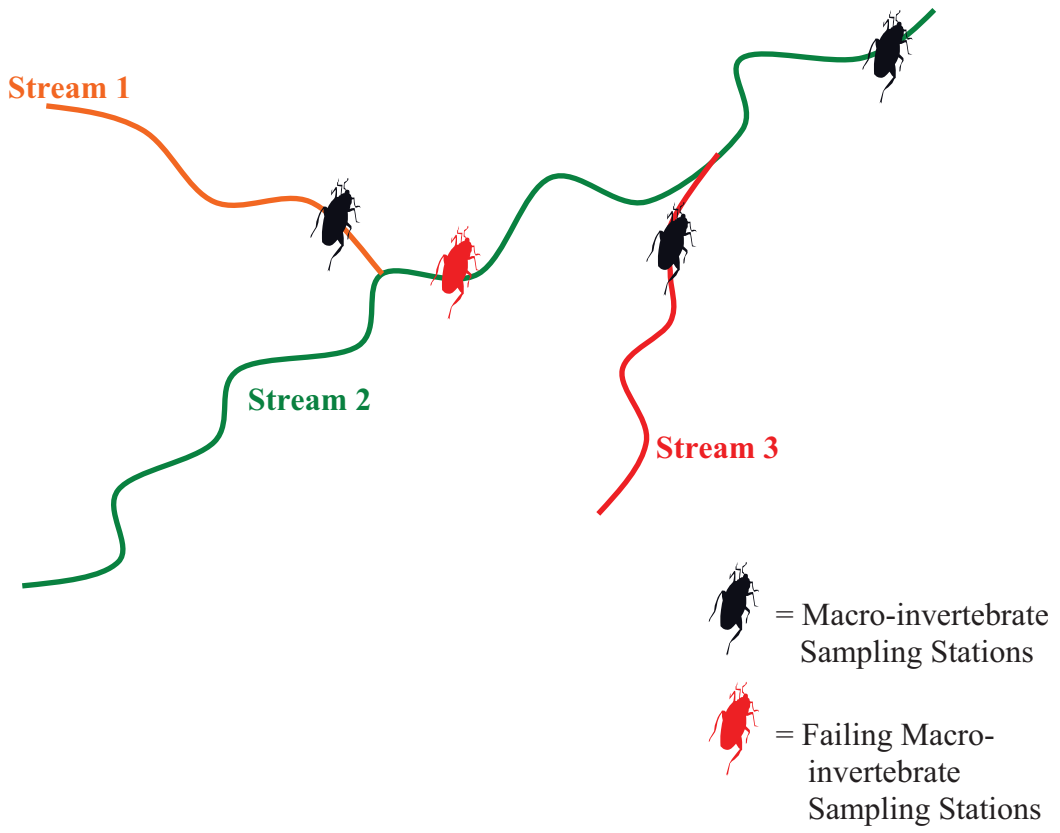
Data Assimilation Example:
Based upon the total credits generated by **Stream 1**, it represents 20% of the total stream credits generated for the mitigation bank. In accordance with the success criteria (target levels) set for Fecal Coliform, the monitoring station within **Stream 1** met the performance standard.

Based upon the total credits generated by **Stream 2**, it represents 70% of the total stream credits generated for the mitigation bank. In accordance with the success criteria (target levels) set for Fecal Coliform, the monitoring station within **Stream 2** failed the performance standard.

Based upon the total credits generated by **Stream 3**, it represents 10% of the total stream credits generated for the mitigation bank. In accordance with the success criteria (target levels) set for Fecal Coliform, the monitoring station within **Stream 3** met the performance standard.

Total Variable Score:
Based upon the above example, the Fecal Coliform variable score is **30% (Stream 1 (20%) + Stream 2 (0%) + Stream 3 (10%) = 30%)**. The achievement of a total variable score below 80% would result in a failing score "-" for the variable.

Figure 3. Stream Biological Factor – Macro-invertebrate Site Index



Description of Stream Credit Generation:
Stream 1 – This stream is scheduled to generate 2,000 stream credits (associated with both in-stream and riparian buffer activities).

Stream 2 – This stream is scheduled to generate 7,000 stream credits (associated with both in-stream and riparian buffer activities).

Stream 3 – This stream is scheduled to generate 1,000 stream credits (associated with both in-stream and riparian buffer activities).

Data Assimilation Example:
Based upon the total credits generated by **Stream 1**, it represents 20% of the total stream credits generated for the mitigation bank. In accordance with the success criteria set for the Macro-invertebrate Site Index, the monitoring station within **Stream 1** met the performance standard.

Based upon the total credits generated by **Stream 2,** it represents 70% of the total stream credits generated for the mitigation bank. **Stream 2** has two Macro-invertebrate sampling stations, which each represent approximately 3,500 stream credits (35% of the total stream credits). In accordance with the success criteria set for the Macro-invertebrate Site Index, one out of two monitoring stations within **Stream 2** met the performance standard.

Based upon the total credits generated by **Stream 3**, it represents 10% of the total stream credits generated for the mitigation bank. In accordance with the success criteria set for the Macro-invertebrate Site Index, the monitoring station within **Stream 3** met the performance standard.

Total Variable Score:
Based upon the above example, the Macro-invertebrate Site Index variable score is **65% (Stream 1 (20%) + Stream 2 (35%) + Stream 3 (10%) = 65%)**. The achievement of a total variable score below 80% would result in a failing score "-" for the variable.

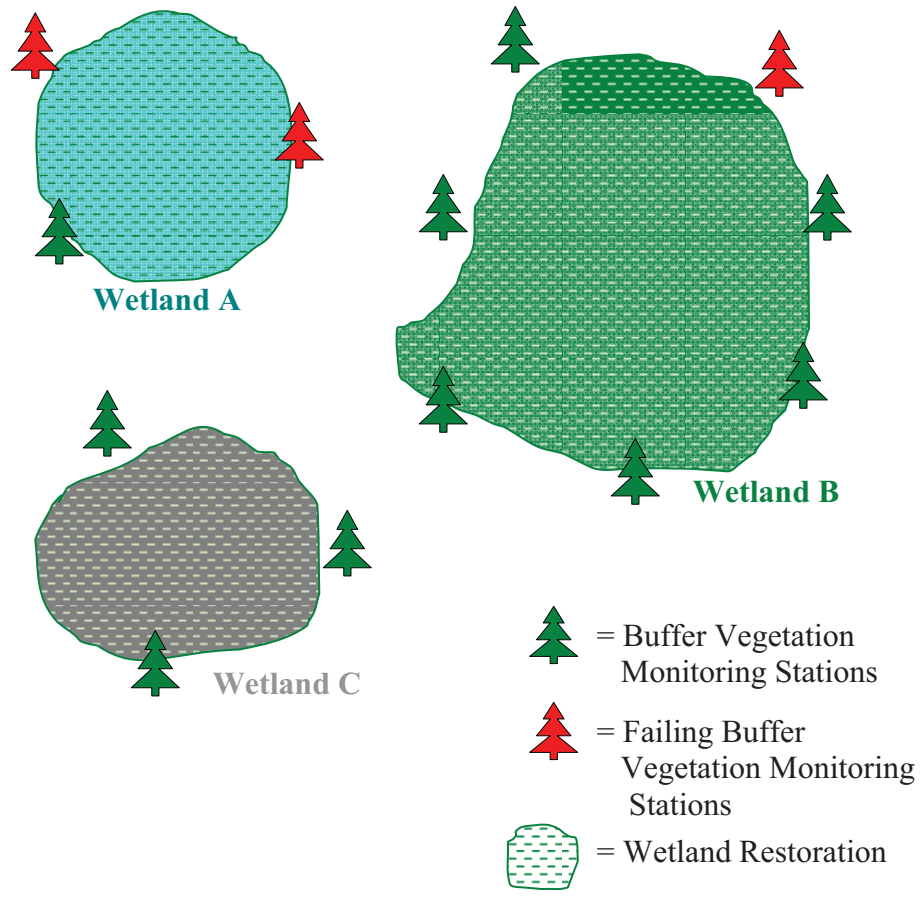
Example 1 - Stream Performance Standard Summary:

PHYSICAL VARIABLES	**SCORE (+/-)**	**TOTAL (%)**
Channel Dimension	+	33.33%
Channel Pattern and Profile	+	33.33%
Streambank Stability and Nearbank Stress	+	33.33%
TOTAL		**100%***
** In order to get ANY stream credit release, a (+) score must be achieved for all variables for this factor.*		
CHEMICAL VARIABLES	**SCORE (+/-)**	**TOTAL (%)**
Temperature	+	8.33%
Dissolved Oxygen or Biochemical Oxygen Demand	+	8.33%
pH	+	8.33%
Total Suspended Solids	+	8.33%
Fecal Coliform	-	0%
Nitrates	+	33.33%
TOTAL		**66.66%**
BIOLOGICAL VARIABLES	**SCORE (+/-)**	**TOTAL (%)**
Riparian Vegetation Survival and Growth	+	20%
Riparian Structure	+	20%
Fish Index of Biotic Integrity	+	20%
Macro-invertebrate Site Index	-	0%
Physical Habitat Assessment	+	20%
TOTAL		**80%**

STREAM PERFORMANCE STANDARDS SUMMARY	TOTAL (%)
PHYSICAL SCORE	100%
CHEMICAL SCORE	66.66%
BIOLOGICAL SCORE	80%
TOTAL MEAN SCORE	82.22%
In this example, the stream mitigation bank would achieve a release of 100% of the total credits scheduled for release during that monitoring period.	

Example 2: Figures 4 through 6 are examples of wetland data assimilation for individual wetland variables. A Wetland Performance Standards Summary for Example 2 can be found following Figure 6.

Figure 4. Wetland Buffer Factor – Buffer Vegetation and Survival Growth



Description of Wetland Credit Generation:
Wetland A – This wetland is scheduled to generate 20 wetland credits (associated with wetland hydrological and vegetative restoration, and wetland buffer restoration activities).

Wetland B – This wetland is scheduled to generate 70 wetland credits (associated with wetland hydrological and vegetative restoration, and wetland buffer restoration activities).

Wetland C – This wetland generates 10 wetland credits (associated with wetland hydrological and vegetative restoration, and wetland buffer restoration activities).

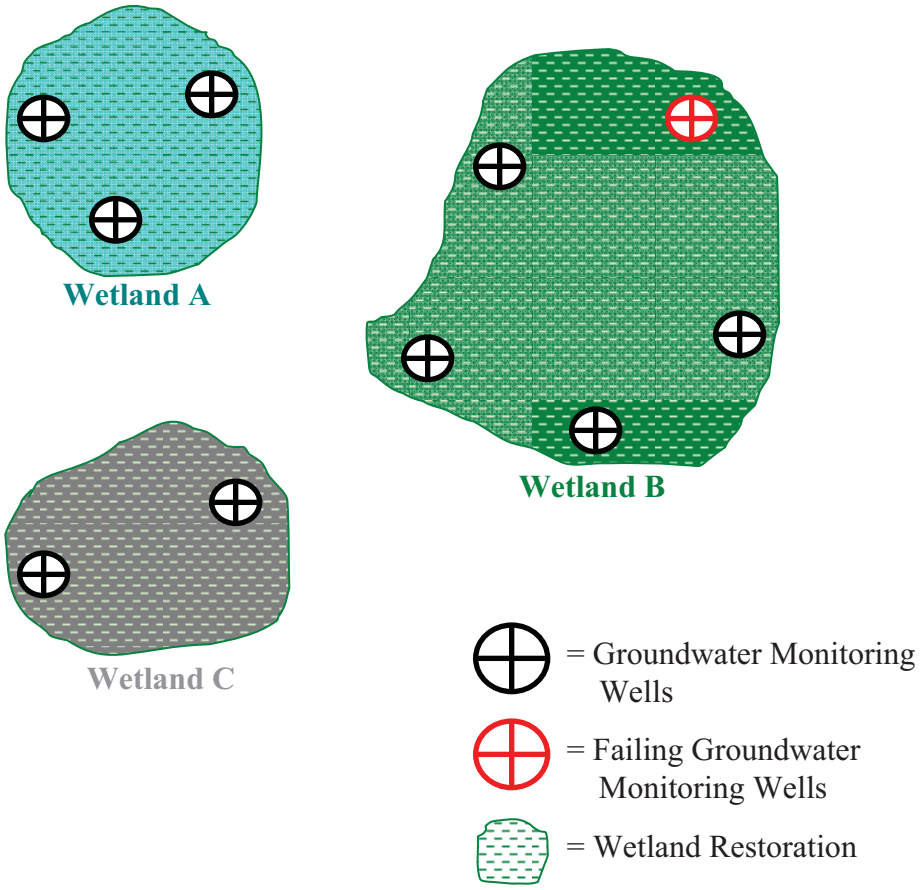
Data Assimilation Example:
Based upon the total credits generated by **Wetland A**, it represents 20% of the total wetland credits generated for the mitigation bank. In accordance with the success criteria set for Buffer Vegetation and Survival Growth, one out of three monitoring stations (6.66%) within **Wetland A** met the performance standard.

Based upon the total credits generated by **Wetland B**, it represents 70% of the total wetland credits generated for the mitigation bank. In accordance with the success criteria set for Buffer Vegetation and Survival Growth, six out of seven of the monitoring stations (60%) within **Wetland B** met the performance standard.

Based upon the total credits generated by **Wetland C**, it represents 10% of the total wetland credits generated for the mitigation bank. In accordance with the success criteria set for Buffer Vegetation and Survival Growth, all of the monitoring stations within **Wetland C** met the performance standard.

Total Variable Score:
Based upon the above example, the Buffer Vegetation and Survival Growth variable score is **76.66% (Wetland A (6.66%) + Wetland B (60%) + Wetland C (10%) = 76.66%)**. The achievement of a total variable score below 80% would result in a failing score "-" for the variable.

Figure 5. Wetland Abiotic Factor –Hydrologic Regime



Description of Wetland Credit Generation:
Wetland A – This wetland is scheduled to generate 20 wetland credits (associated with wetland hydrological and vegetative restoration, and wetland buffer restoration activities).

Wetland B – This wetland is scheduled to generate 70 wetland credits (associated with wetland hydrological and vegetative restoration, and wetland buffer restoration activities).

Wetland C – This wetland is scheduled to generate 10 wetland credits (associated with wetland hydrological and vegetative restoration, and wetland buffer restoration activities).

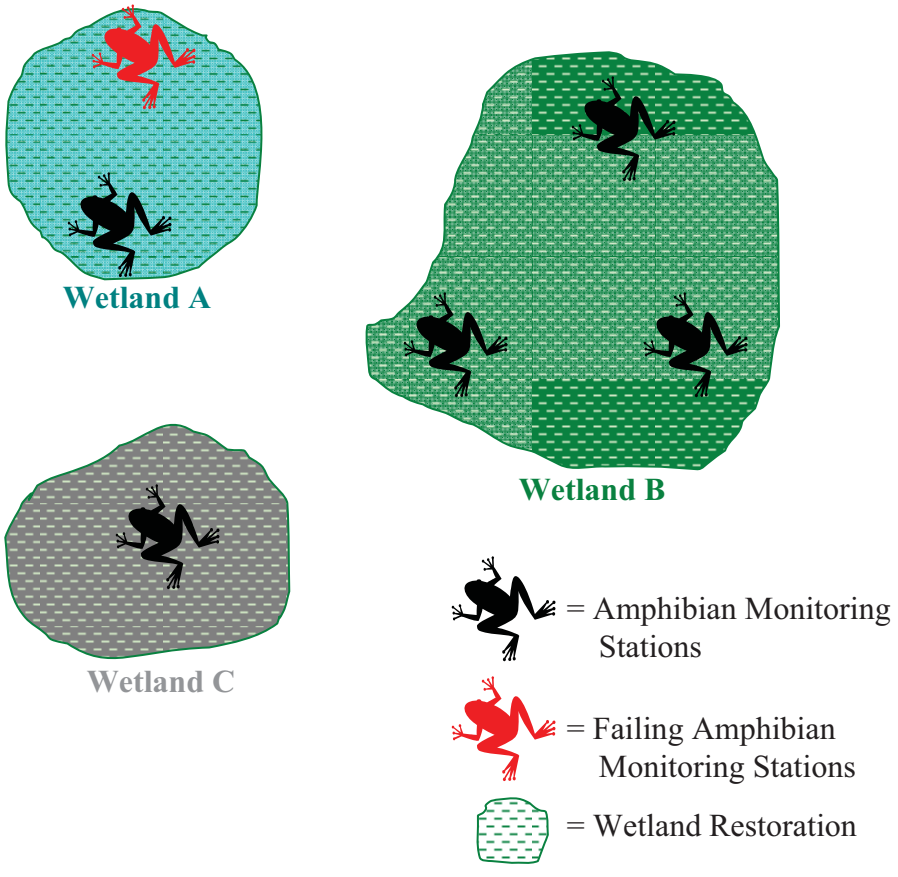
Data Assimilation Example:
Based upon the total credits generated by **Wetland A**, it represents 20% of the total wetland credits generated for the mitigation bank. In accordance with the success criteria set for Hydrologic Regime, all monitoring stations within **Wetland A** met the performance standard.

Based upon the total credits generated by **Wetland B**, it represents 70% of the total wetland credits generated for the mitigation bank. In accordance with the success criteria set for Hydrologic Regime, four out of five of the monitoring stations (56%) within **Wetland B** met the performance standard.

Based upon the total credits generated by Wetland C, it represents 10% of the total wetland credits generated for the mitigation bank. In accordance with the success criteria set for Hydrologic Regime, the monitoring station within Wetland C met the performance standard.

Total Variable Score:
Based upon the above example, the Hydrologic Regime variable score is **86% (Wetland A (20%) + Wetland B (56%) + Wetland C (10%) = 86%)**. The achievement of a total variable score between 80% and 100% would result in a passing score "+" for the variable.

Figure 6. Wetland Biotic Factor – Amphibian Richness and Abundance



Description of Wetland Credit Generation:
Wetland A – This segment is scheduled to generate 20 wetland credits (associated with wetland hydrological and vegetative restoration, and wetland buffer restoration activities).

Wetland B – This segment is scheduled to generate 70 wetland credits (associated with wetland hydrological and vegetative restoration, and wetland buffer restoration activities).

Wetland C – This wetland is scheduled to generate 10 wetland credits (associated with wetland hydrological and vegetative restoration, and wetland buffer restoration activities).

Data Assimilation Example:
Based upon the total credits generated by **Wetland A**, it represents 20% of the total wetland credits generated for the mitigation bank. In accordance with the success criteria set for Amphibian Richness and Abundance, one out of two monitoring stations (10 %) within **Wetland A** met the performance standard.

Based upon the total credits generated by **Wetland B**, it represents 70% of the total wetland credits generated for the mitigation bank. In accordance with the success criteria set for Amphibian Richness and Abundance, all monitoring stations within **Wetland B** met the performance standard.

Based upon the total credits generated by Wetland C, it represents 10% of the total wetland credits generated for the mitigation bank. In accordance with the success criteria set for Amphibian Richness and Abundance, the monitoring station within Wetland C met the performance standard.

Total Variable Score:
Based upon the above example, the Amphibian Richness and Abundance variable score is **90% (Wetland A (10%) + Wetland B (70%) + Wetland C (10%) = 90%)**. The achievement of a total variable score between 80% and 100% would result in a passing score "+" for the variable.

Example 2 - Wetland Performance Standard Summary:

BUFFER VARIABLES	**SCORE (+/-)**	**TOTAL (%)**
Buffer Vegetation and Survival Growth	-	0%
Buffer Vegetation Structure	+	33.33%
Percent Cover of Herbaceous Layer and Litter	+	33.33%
TOTAL		**66.66%**
ABIOTIC VARIABLES	**SCORE (+/-)**	**TOTAL (%)**
Development of Hydric Soil Conditions	+	50%
Increase Surface Hydrology	+	50%
TOTAL		**100%***
** In order to get ANY wetland credit release, a (+) score must be achieved for all variables for this factor.*		
BIOTIC VARIABLES	**SCORE (+/-)**	**TOTAL (%)**
Wetland Vegetation Survival and Growth	-	0%
Wetland Structure	+	20%
Development of Vascular Hydrophytic Vegetation	+	20%
Functional Assessment	-	0%
Native Amphibian Richness and Abundance	+	20%
TOTAL		**60%**

WETLAND PERFORMANCE STANDARDS SUMMARY	**TOTAL (%)**
BUFFER SCORE	**66.66%**
ABIOTIC SCORE	**100%**
BIOTIC SCORE	**60%**
TOTAL MEAN SCORE	**75.55%**
In this example, the wetland mitigation bank would achieve a release of 50% of the total credits scheduled for release during that monitoring period.	

Example 3: In this example, the mitigation bank is comprised of both stream and wetland credits. Using the total mean scores from the Stream and Wetland Performance Standards Summaries in Examples 1 and 2, the mitigation bank would have achieved a stream credit release of 100% and wetland credit release of 50% of total credits scheduled for release during that monitoring period. However, for a mitigation bank that is comprised of both stream and wetland credits, if the total individual mean score for one or both (i.e., stream and/or wetland) achieve a credit release of 50%, then the total credits released for both stream and wetland would not be greater than 50%. (Note: If the total individual mean scores for both (i.e., stream and wetland) achieve 80% respectively, then the total credit release for both stream and wetland would be 100%. If the total individual mean score for either one of both (i.e., stream and/or wetland) achieve less that 60%, then there would be no stream or wetland credit release for that monitoring period.)