Appendix K: Composite Variable Calculations

Buffer

***Buffer* represents the presence and integrity of undisturbed buffer adjacent to the AU.**

Sub-Variables	Description
BuffIntact	Percent of AU perimeter with intact buffer
BuffWidth	Average width of adjacent undisturbed buffer

$$\boldsymbol{Buffer = \frac{2(BuffIntact) + BuffWidth}{3}}$$

Sub-Variables

BuffIntact – percent of the AU perimeter with adjacent intact buffer at least 10m wide.

Indicators: The percent of the perimeter with intact buffer (defined as undisturbed area, at least 10m wide, of any habitat type including open water) is calculated using GIS in the office and recorded in Section G-4b of the Data Sheet AFTER the AU boundary has been confirmed in the field and finalized.

Scoring: Each of the 12 *BuffIntact* classes is assigned a numeric score between 0 and 10 (see table below). The score for the applicable percentage class is used as the sub-variable score.

***BuffIntact* Classes and Scores (Composite Variable: *Buffer*)**							
PERCENT OF PERIMETER	SCORE	PERCENT OF PERIMETER	SCORE	PERCENT OF PERIMETER	SCORE	PERCENT OF PERIMETER	SCORE
None	0	15 – 24%	2	45 – 54%	5	75 – 84%	8
1 – 4%	0	25 – 34%	3	55 – 64%	6	85 – 94%	9
5 – 14%	1	35 – 44%	4	65 – 74%	7	≥ 95%	10

BuffWidth – the average width of any adjacent undisturbed buffer.

Indicators: The width of adjacent buffer is measured along 8 equally spaced transects (up to a maximum of 100m) using GIS in the office and recorded in Section G-4c of the Data Sheet AFTER the AU boundary has been confirmed in the field and finalized. The average width is calculated and recorded in Section G-4d of the Data Sheet.

Scoring: Each of the 12 *BuffWidth* classes is assigned a numeric score between 0 and 10 (see table below). The score for the applicable width class is used as the sub-variable score.

***BuffWidth* Classes and Scores (Composite Variable: *Buffer*)**							
BUFFER WIDTH	SCORE	BUFFER WIDTH	SCORE	BUFFER WIDTH	SCORE	BUFFER WIDTH	SCORE
None	0	15 – 24m	2	45 – 54m	5	75 – 84m	8
1 – 4m	0	25 – 34m	3	55 – 64m	6	85 – 94m	9
5 – 14m	1	35 – 44m	4	65 – 74m	7	≥ 95m	10

Application and Calculation

Scope: Stand-alone variable in the Plant Community Integrity and Wildlife Habitat Integrity models.

Calculation: Calculated in the office using GIS after the site visit. See Appendix J for detailed GIS instructions and examples.

Scoring: The equation for *Buffer* generates a value between 0 and 10. The score for *Buffer* = 0 if the AU has less than 5% intact buffer AND the average buffer width is less than 15m.

CarbonBiomass

***CarbonBiomass* represents the amount of living biomass storing carbon in the AU.**

Sub-Variables	Description
TreeCov	Areal cover of vegetation in the tree layer
LiveBA	Basal area of live tree stems rooted in the AU
Understory	Areal cover of vegetation in the understory layer

$$\boldsymbol{CarbonBiomass = \frac{3(TreeCov) + 2(LiveBA) + Understory}{6}}$$

Sub-Variables

TreeCov – estimate of the areal cover of vegetation in the tree layer.

Indicators: Areal cover of vegetation in the tree layer (all woody plants 6m or taller, regardless of diameter) is recorded by cover class in Section C-1b(4) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the ten *TreeCov* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the cover class recorded at each sub-unit. *TreeCov* sub-unit scores are weighted by area (see Appendix E) to calculate the *CarbonBiomass* variable score.

Understory – estimate of the areal cover of vegetation in the understory layer.

Indicators: Areal cover of vegetation in the understory layer (all woody plants less than 6m in height AND all non-woody plants, regardless of height, including mosses and aquatic bed plants) is recorded by cover class in Section C-1b(3) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the ten *Understory* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the cover class recorded at each sub-unit. *Understory* sub-unit scores are weighted by area (see Appendix E) to calculate the *CarbonBiomass* variable score.

***TreeCov* and *Understory* Classes and Scores (Composite Variable: *CarbonBiomass*)**							
COVER CLASS	SCORE	COVER CLASS	SCORE	COVER CLASS	SCORE	COVER CLASS	SCORE
None	0	5 – 15%	1	40 – 60%	5	85 – 95%	9
<1% (Trace)	0	16 – 25%	2	61 – 74%	7	> 95%	10
1 – 4%	0	26 – 39%	3	75 – 84%	8		

LiveBA – estimate of the total cross-sectional area of live trees rooted in the AU.

Indicators: The diameter at breast height (DBH) of every live tree rooted in a representative 10x10m² plot is measured and recorded in Section C-2a(2) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field. DBH measurements are converted to basal area and the total basal area of live trees is recorded in Section C-2b(1) of the Data Sheet. Trees are defined as all woody plants 6m or taller, regardless of diameter.

Scoring: Each of the 12 *LiveBA* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the total live basal area recorded at each sub-unit. *LiveBA* sub-unit scores are weighted by area (see Appendix E) to calculate the *CarbonBiomass* variable score.

***LiveBA* Classes and Scores (Composite Variable: *CarbonBiomass*)**							
BASAL AREA	SCORE	BASAL AREA	SCORE	BASAL AREA	SCORE	BASAL AREA	SCORE
No Trees	0	0.0750 – 0.1249	2	0.2250 – 0.2749	5	0.3750 – 0.4249	8
< 0.0250	0	0.1250 – 0.1749	3	0.2750 – 0.3249	6	0.4250 – 0.4749	9
0.0250 – 0.0749	1	0.1750 – 0.2249	4	0.3250 – 0.3749	7	≥ 0.4750	10

Application and Calculation

Scope: Used by one function only: stand-alone variable in the Carbon Sequestration model.

Calculation: When the AU consists of more than one vegetated wetland sub-unit, *CarbonBiomass* must be weighted by sub-unit area to determine the variable score. See Appendix E for detailed instructions on sub-unit weighting.

Scoring: The equation for *CarbonBiomass* generates a value between 0 and 10. The score for *CarbonBiomass* = 0 if the weighted sub-unit average is less than 5% tree cover AND no more than 15% understory cover AND the total basal area is less than 0.0250.

Detention

***Detention* represents the capacity of the system to detain water during a storm surge event.**

Sub-Variables	Description
WetWidth	Average width of wetland system (not limited to the AU)
SysTotal	Area of entire wetland system (not limited to the AU)

$$\boldsymbol{Detention = \frac{2(WetWidth) + SysTotal}{3}}$$

Sub-Variables

WetWidth – the average width of the wetland system (including but not limited to the AU) as measured from the shoreline.

Indicators: The distance between the shoreline and the landward edge of the wetland system is measured every 100m along transects perpendicular to the shoreline using GIS in the office AFTER the wetland system extent has been confirmed in the field. The average width is calculated and recorded in Section G-7c of the Data Sheet.

Scoring: Each of the six *WetWidth* classes is assigned a numeric score between 0 and 10 (see table below). The score for the applicable width class is used as the sub-variable score.

***WetWidth* Classes and Scores (Composite Variable: *Detention*)**					
WETLAND WIDTH	SCORE	WETLAND WIDTH	SCORE	WETLAND WIDTH	SCORE
< 10 meter(s)	0	20 to < 30 meters	4	40 to < 50 meters	8
10 to < 20 meters	2	30 to < 40 meters	6	≥ 50 meters	10

SysTotal– the area of the entire wetland system (including but not limited to the AU).

Indicators: The total area of the wetland system is calculated using GIS and recorded in Section G-1b of the Data Sheet in the office AFTER the wetland system extent has been confirmed in the field.

Scoring: Each of the seven *SysTotal* classes is assigned a numeric score between 1 and 10 (see table below). The score for the applicable area class is used as the sub-variable score.

***SysTotal* Classes and Scores (Composite Variable: *Detention*)**							
SYSTEM AREA	SCORE	SYSTEM AREA	SCORE	SYSTEM AREA	SCORE	SYSTEM AREA	SCORE
< 0.25 ha	1	2 to < 4 ha	4	8 to < 20 ha	8	≥ 40 ha	10
0.25 to < 2 ha	2	4 to < 8 ha	6	20 to < 40 ha	9		

Application and Calculation

Scope: Used by one function only: stand-alone variable in the Storm Surge Reduction model. When Storm Surge Reduction is not applicable, *Detention* does not need to be calculated.

Calculation: Calculated in the office using GIS after the site visit. See Appendix J for detailed GIS instructions and examples.

Scoring: The equation for *Detention* generates a value between 0 and 10. The score for *Detention* = 0 if the average width of the wetland system is less than 10 meters AND the area is less than 0.25 hectare.

ET

***ET* represents the loss of groundwater that is absorbed by plants through their roots and exits the system as transpiration and/or evaporation.**

Sub-Variables	Description
TreeCov	Areal cover of vegetation in the tree layer
Understory	Areal cover of vegetation in the understory layer

$$\boldsymbol{ET = \frac{2(TreeCov) + Understory}{3}}$$

Sub-Variables

TreeCov – estimate of the areal cover of vegetation in the tree layer.

Indicators: Areal cover of vegetation in the tree layer (all woody plants 6m or taller, regardless of diameter) is recorded by cover class in Section C-1b(4) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the ten *TreeCov* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the cover class recorded at each sub-unit. *TreeCov* sub-unit scores are weighted by area (see Appendix E) to calculate the *ET* variable score.

Understory – estimate of the areal cover of vegetation in the understory layer.

Indicators: Areal cover of vegetation in the understory layer (all woody plants less than 6m in height AND all non-woody plants, regardless of height, including mosses and aquatic bed plants) is recorded by cover class in Section C-1b(3) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the ten *Understory* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the cover class recorded at each sub-unit. *Understory* sub-unit scores are weighted by area (see Appendix E) to calculate the *ET* variable score.

***TreeCov* and *Understory* Classes and Scores (Composite Variable: *ET*)**							
COVER CLASS	SCORE	COVER CLASS	SCORE	COVER CLASS	SCORE	COVER CLASS	SCORE
None	0	5 – 15%	1	40 – 60%	5	85 – 95%	9
<1% (Trace)	0	16 – 25%	2	61 – 74%	7	> 95%	10
1 – 4%	0	26 – 39%	3	75 – 84%	8		

Application and Calculation

Scope: Used by one function only: stand-alone variable in the Streamflow Maintenance model. When Streamflow Maintenance is not applicable, *ET* does not need to be calculated.

Calculation: When the AU consists of more than one vegetated wetland sub-unit, *ET* must be weighted by sub-unit area to determine the variable score. See Appendix E for detailed instructions on sub-unit weighting.

Scoring: The equation for *ET* generates a value between 0 and 10. The score for *ET* = 0 if the weighted sub-unit average is less than 5% tree cover AND no more than 15% understory cover.

ExportBiomass

***ExportBiomass* represents the amount of living biomass available for export to downstream organisms.**

Sub-Variables	Description
TreeCov	Areal cover of vegetation in the tree layer
Understory	Areal cover of vegetation in the understory layer

$$\boldsymbol{ExportBiomass = \frac{3(TreeCov) + Understory}{4}}$$

Sub-Variables

TreeCov – estimate of the areal cover of vegetation in the tree layer.

Indicators: Areal cover of vegetation in the tree layer (all woody plants 6m or taller, regardless of diameter) is recorded by cover class in Section C-1b(4) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the ten *TreeCov* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the cover class recorded at each sub-unit. *TreeCov* sub-unit scores are weighted by area (see Appendix E) to calculate the *ExportBiomass* variable score.

Understory – estimate of the areal cover of vegetation in the understory layer.

Indicators: Areal cover of vegetation in the understory layer (all woody plants less than 6m in height AND all non-woody plants, regardless of height, including mosses and aquatic bed plants) is recorded by cover class in Section C-1b(3) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the ten *Understory* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the cover class recorded at each sub-unit. *Understory* sub-unit scores are weighted by area (see Appendix E) to calculate the *ExportBiomass* variable score.

***TreeCov* and *Understory* Classes and Scores (Composite Variable: *ExportBiomass*)**							
COVER CLASS	SCORE	COVER CLASS	SCORE	COVER CLASS	SCORE	COVER CLASS	SCORE
None	0	5 – 15%	1	40 – 60%	5	85 – 95%	9
<1% (Trace)	0	16 – 25%	2	61 – 74%	7	> 95%	10
1 – 4%	0	26 – 39%	3	75 – 84%	8		

Application and Calculation

Scope: Used by one function only: stand-alone variable in the Production Export model.

Calculation: When the AU consists of more than one vegetated wetland sub-unit, *ExportBiomass* must be weighted by sub-unit area to determine the variable score. See Appendix E for detailed instructions on sub-unit weighting.

Scoring: The equation for *ExportBiomass* generates a value between 0 and 10. The score for *ExportBiomass* = 0 if the weighted sub-unit average is less than 5% tree cover AND no more than 15% understory cover.

GWDischarge

***GWDischarge* represents the combination of features which enable the movement of groundwater to the soil surface.**

Sub-Variables	Description
Position	Landscape context (geomorphic position) of the AU
SurficialGeo	Origin/composition of unconsolidated geologic deposits
Organic	Thickness of organic soil layer(s) if present

$$\boldsymbol{GWDischarge = \frac{2(Position) + 2(SurficialGeo) + Organic}{5}}$$

Sub-Variables

Position – the landscape context (geomorphic position or location) of the AU.

Indicators: Landscape position is evaluated remotely before the site visit and then confirmed and recorded in Section D-1b of the Data Sheet at EACH Soil Examination Area in the field.

Scoring: Each of the 12 *Position* value options is assigned a numeric score between 1 and 10 (see table below). The user notes the score for the landscape position value recorded at each SEA.

***Position* Values and Scores (Composite Variable: *GWDischarge*)**					
VALUE	SCORE	VALUE	SCORE	VALUE	SCORE
Groundwater Slope	10	Groundwater Depression	10	Marine Fringe	4
Surface Water Slope	1	Surface Water Depression	1	Estuarine Fringe	8
Groundwater Flat	5	River/Stream Fringe	9	Fresh Water Tidal Fringe	9
Surface Water Flat	1	River/Stream Floodplain	2	Lake/Pond Fringe	10

SurficialGeo – the origin and composition of the unconsolidated deposits below the soil surface

Indicators: Surficial geology is evaluated remotely before the site visit and then confirmed and recorded in Section D-1a of the Data Sheet at EACH Soil Examination Area in the field.

Scoring: Each of the 14 *SurficialGeo* value options is assigned a numeric score between 1 and 10 (see table below). The user notes the score for the surficial geology value recorded at each SEA.

***SurficialGeo* Values and Scores (Composite Variable: *GWDischarge*)**					
VALUE	SCORE	VALUE	SCORE	VALUE	SCORE
Lodgment Till	2	Coarse-Grained Alluvium	10	Shallow Bedrock	1
Melt-Out Till	9	Fine-Grained Alluvium	1	Coastal Sands	10
Mixed Glacial Materials	5	Colluvium	9	Inland Organic Materials	5
Stratified Coarse Materials	10	Dense Anthropogenic	2	Tidally-Flooded Organic Materials	5
Stratified Fine Materials	1	Loose Anthropogenic	9		

Organic – estimate of the amount of organic material below the soil surface.

Indicators: Organic layer thickness is measured and recorded in Section D-2c of the Data Sheet at EACH Soil Examination Area in the field.

Scoring: Each of the six *Organic* class value options is assigned a score between 1 and 10 (see table below). The user notes the score for the organic layer thickness class recorded at each SEA. When there is no organic layer thicker than 4cm, the texture class of the uppermost mineral soil layer is selected as the SEA attribute value.

***Organic* Classes and Scores (Composite Variable: *GWDischarge*)**						
THICKNESS	CLASS	SCORE	THICKNESS	CLASS	TOP MINERAL LAYER	SCORE
> 130 cm	Deep Organic	10	0 – 4 cm	No Organic Layer	Mucky Mineral	2
41 – 130 cm	Shallow Organic	8			Loamy or Clayey Mineral	1
5 – 40 cm	Limited Organic	6			Sandy Mineral	4

Application and Calculation

Scope: Used by one function only: stand-alone variable in the Streamflow Maintenance model. When Streamflow Maintenance is not applicable, *GWDischarge* does not need to be calculated.

Calculation: *GWDischarge* must be calculated for EACH Soil Examination Area and the results are ranked to determine the variable score. See Appendix F for detailed instructions on calculating scores and ranking variables derived from SEA data.

Scoring: The equation for *GWDischarge* generates a value between 1 and 10. The score for *GWDischarge* = 1 if the landscape position of the assessment unit is either Surface Water Depression, Flat or Slope AND the surficial geology is either Stratified Fine Materials, Fine-Grained Alluvium or Shallow Bedrock AND there is less than 4cm organic with Loamy or Clayey soil as the uppermost mineral layer.

HabFeat

***HabFeat* represents the structural complexity of the AU and the presence of specialized habitat features.**

Sub-Variables	Description
Strata	Number of vegetation strata present
Heterogeneity	Presence and type of microhabitats
WildFeat	Presence and number of specialized habitat features
$$\boldsymbol{HabFeat = Strata + Heterogeneity + WildFeat}$$	

Sub-Variables

Strata – the number of plant strata as a measure of vertical structural complexity.

Indicators: All strata with at least 5% areal cover are recorded in Section C-1a of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the four *Strata* classes is assigned a numeric score between 1 and 3 (see table below) based on the typical number of strata for each Sub-Unit type. The user notes the applicable class score for the number of strata recorded at each Sub-Unit.

***Strata* Classes and Scores (Composite Variable: *HabFeat*)**						
STRATA COUNT	Emergent Sub-Unit		Scrub-Shrub Sub-Unit		Forested Sub-Unit	
	CLASS	SCORE	CLASS	SCORE	CLASS	SCORE
One	Typical	2	Low	1	Low	1
Two	High	3	Typical	2	Low	1
Three	High	3	High	3	Typical	2
Four +	High	3	High	3	High	3

Heterogeneity – the presence and type of microhabitats as a measure of horizontal complexity.

Indicators: All microhabitats observed are recorded in Section C-1c of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field. Microhabitats are patches at least 4m² which are of a different type than the Sub-Unit in which they are located.

Scoring: Each of the four *Heterogeneity* classes is assigned a numeric score between 0 and 3 (see table below). The user notes the applicable score for the number of microhabitats recorded at each Sub-Unit.

***Heterogeneity* Classes and Scores (Composite Variable: *HabFeat*)**			
MICROHABITAT COUNT	SCORE	MICROHABITAT COUNT	SCORE
None	0	3 – 4	2
1 – 2	1	5+	3

WildFeat – the presence and number of specialized wildlife habitat features.

Indicators: All wildlife habitat features observed are recorded in Section C-4a of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the five *WildFeat* classes is assigned a numeric score between 0 and 4 (see table below). The user notes the applicable class score for the number of wildlife habitat features recorded at each Sub-Unit.

***WildFeat* Classes and Scores (Composite Variable: *HabFeat*)**					
FEATURE COUNT	SCORE	FEATURE COUNT	SCORE	FEATURE COUNT	SCORE
None	0	3 – 5	2	10 +	4
1 – 2	1	6 – 9	3		

Application and Calculation

Scope: Used by one function only: stand-alone variable in the Wildlife Habitat Integrity model.

Calculation: *HabFeat* is calculated as the sum of the three sub-variables which have unique scoring scales: *Strata* is scored 1-3, *Heterogeneity* is scored 0-3, and *WildFeat* is scored 0-4. When the AU consists of more than one vegetated wetland sub-unit, *HabFeat* must be weighted by sub-unit area to determine the variable score. See Appendix E for detailed instructions on sub-unit weighting.

$$HabFeat = Strata + Heterogeneity + WildFeat$$

Documentation of strata, microhabitats and specialized habitat features (see Chapter 4C for details) and scoring of *Strata* varies depending on sub-unit type.

EXAMPLE:	*Strata*	*Heterogeneity*	*WildFeat*
V1 (Forested)	2 strata = Low	3 microhabitat types	8 features
	Sub-score = 1	**Sub-score = 2**	**Sub-score = 3**
V2 (Emergent)	2 strata = High	1 microhabitat type	10 features
	Sub-score = 3	**Sub-score = 1**	**Sub-score = 4**

The variable is calculated for each sub-unit along with the weighting factor for that sub-unit.

	Sub-Unit Calculation	**Sub-Unit Area**	**Weighting Factor**
V1 (Forested)	$HabFeat(V1) = 1 + 2 + 3 = \mathbf{6}$	9.45 ha	$^{9.45}/_{11.10} = \mathbf{0.85}$
V2 (Emergent)	$HabFeat(V2) = 3 + 1 + 4 = \mathbf{8}$	1.65 ha	$^{1.65}/_{11.10} = \mathbf{0.15}$

The sub-scores are weighted by sub-unit area to find the variable score for *HabFeat*.

$$\boldsymbol{HabFeat} = (\mathbf{6} \times \mathbf{0.85}) + (\mathbf{8} \times \mathbf{0.15}) \quad \mathbf{6.3}$$

Scoring: The equation for *HabFeat* generates a value between 1 and 10. The score for *HabFeat* = 1 if the sub-unit has minimal strata AND no microhabitats AND no specialized habitat features.

HumanActivity

***HumanActivity* represents the impact of recent human activity in or near the AU.**

Sub-Variables	Description
ActivIntensity	Presence and intensity of recent human activity
ActivProportion	Proportion of AU impacted by recent human activity

$$\boldsymbol{HumanActivity} = \min_{A \in \{1,\ldots n\}} \sqrt{\boldsymbol{ActivIntensity}_A \times \boldsymbol{ActivProportion}_A} \quad \text{and } \boldsymbol{A} = \text{each activity}$$

Sub-Variables

ActivIntensity – intensity of recent human activity in or within 100m of the AU.

Indicators: Evidence of any human activity within the last two years is evaluated and recorded using the intensity scale (below) in the field. Seven listed activities which must be observed in the AU are documented in Section F-1a(1) of the Data Sheet. Eight additional activities which may be observed in OR near the AU are recorded in Section F-1b(1) of the Data Sheet.

Scoring: The *ActivIntensity* scale describes the intensity and impact of each activity. A-D ratings are assigned a numeric score between 1 and 10 (see table below); scores DECREASE as intensity INCREASES. The user notes the score for the intensity rating recorded for EACH listed activity.

***ActivIntensity* Ratings and Scores (Composite Variable: *HumanActivity*)**		
RATING	DEGREE OF INTENSITY	SCORE
N/A	No evidence of activity observed	10
A	Minimal to no impact evident (activity present, affects aesthetics only)	8
B	Slight impact evident (likely affecting sensitive species)	5
C	Significant impact evident (changing abundances of multiple species)	3
D	Severe impact evident (altering basic community composition)	1

ActivProportion – estimate of the proportion of the AU impacted by recent human activity.

Indicators: The proportion of the AU affected by each observed activity is estimated and recorded in Sections F-1a(2) and Section F-1b(2) of the Data Sheet in the field.

Scoring: Each of the six *ActivProportion* classes is assigned a numeric score between 1 and 10 (see table below); scores DECREASE as proportion INCREASES. The user notes the score for the proportion recorded for EACH listed activity.

***ActivProportion* Classes and Scores (Composite Variable: *HumanActivity*)**					
PROPORTION	SCORE	PROPORTION	SCORE	PROPORTION	SCORE
Not present	10	10 – 33%	7	67 – 90%	3
< 10%	9	34 – 66%	5	> 90%	1

Application and Calculation

Scope: Stand-alone variable in the Plant Community Integrity and Wildlife Habitat Integrity models.

Calculation: The impact of each individual activity is determined by the relationship between the intensity of the activity and the proportion of the AU affected by that activity, and is represented by the activity sub-score in the following equation:

$$SubScore = \sqrt{(Intensity)(Proportion)}$$

The sub-score is calculated for EACH activity and recorded in Sections F-1a(3) and F-1b(3) of the Data Sheet. An activity with a HIGH magnitude of disturbance will generate a LOWER sub-score.

EXAMPLE:		*ActivIntensity*	*ActivProportion*	**Sub-Score Calculation**
Activity 1	Value	A (minimal impact)	< 10% affected	$SubScore = \sqrt{(8)(9)} = \mathbf{8.5}$
	Score	**8**	**9**	
Activity 2	Value	A (minimal impact)	> 90% affected	$SubScore = \sqrt{(8)(1)} = \mathbf{2.8}$
	Score	**8**	**1**	
Activity 3	Value	B (slight impact)	34-66% affected	$SubScore = \sqrt{(5)(5)} = \mathbf{5.0}$
	Score	**5**	**5**	
Activity 4	Value	D (severe impact)	> 90% affected	$SubScore = \sqrt{(1)(1)} = \mathbf{1.0}$
	Score	**1**	**1**	
Activity 5	Value	No evidence	None	$SubScore = \sqrt{(10)(10)} = \mathbf{10.0}$
	Score	**10**	**10**	

The score for *HumanActivity* is equivalent to the LOWEST sub-score which represents the activity with the GREATEST impact on the AU. In the example above, Activity 4 has the greatest magnitude of impact and determines the score for *HumanActivity*:

$$HumanActivity = \min_{A \in \{1,\ldots n\}} \sqrt{ActivIntensity_A \times ActivProportion_A} = \mathbf{1.0}$$

Scoring: The equation for *HumanActivity* generates a value between 1 and 10. The score for *HumanActivity* = 1 if there is an activity rated D (severe impact) affecting more than 90% of the AU. An AU with no evidence of human activity within the last 2 years will receive a score of 10.

> NOTE: The score for *HumanActivity* is equivalent to lowest of ALL activity sub-scores. Do not evaluate the sub-scores for activities in section F-1a separately from the activities in section F-1b.

LandCov

***LandCov* represents the effect of surrounding land use on the habitat integrity of the AU.**

Sub-Variables	Description
LULCZone	Area of zone in which land use is evaluated
LULCArea	Area within 500m classified as each LULC type
LULCWeight	Relative impact of each LULC type

$$\boldsymbol{LandCov} = \sum_{T=1}^{n} \left(\frac{\boldsymbol{LULCArea_T}}{\boldsymbol{LULCZone}}\right)(\boldsymbol{LULCWeight_T}) \quad \text{and} \quad \boldsymbol{T} = \textbf{each LULC type}$$

Sub-Variables

LULCZone – area within 500m of the AU in which land use is evaluated.

Indicators: The total area of the adjacent 500m zone (not including the area of the AU) is calculated using GIS and recorded in Section G-6a of the Data Sheet in the office AFTER the AU boundary has been confirmed in the field and finalized.

Scoring: The total area in hectares is the sub-variable value. There is no associated scoring scale.

LULCArea – the area within the adjacent land use zone classified as each type of land use/land cover.

Indicators: The adjacent 500m zone is classified using the National Land Cover Dataset (NLCD) land use/land cover (LULC) classification. The total area classified as each type of land use/land cover is calculated using GIS and recorded in Section G-6b(2) of the Data Sheet in the office AFTER the AU boundary has been confirmed in the field and finalized.

Scoring: The area (in hectares) of each LULC class is the sub-variable value. There is no associated scoring scale.

LULCWeight – relative impact coefficient assigned to each LULC type.

Indicators: LULC coefficients are based on the relative impact of each type of land use/land cover.

Scoring: Each of the 16 LULC classes is assigned a numeric score between 0 and 10 (see table below). The *LULCWeight* coefficient value is used as the sub-variable score.

***LULCWeight* Values and Scores (Composite Variable: *LandCov*)**			
LULC CLASS	COEFFICIENT	LULC CLASS	COEFFICIENT
Open Water	10	Evergreen Forest	10
Perennial Ice/Snow	10	Mixed Forest	10
Developed, Open Space	3	Scrub Shrub	10
Developed, Low Intensity	2	Grassland/Herbaceous	10
Developed, Med Intensity	1	Pasture/Hay	6
Developed, High Intensity	0	Cultivated Crops	3
Barren (Rock/Sand/Clay)	7	Woody Wetlands	10
Deciduous Forest	10	Emergent Wetlands	10

Application and Calculation

Scope: Used by one function only: stand-alone variable in the Wildlife Habitat Integrity model.

Calculation: Calculated in the office using GIS after the site visit. See Appendix J for detailed GIS instructions and examples. *LandCov* is the sum of the relative effect of each LULC type present in the land use zone.

$$Relative\ Effect = (Proportion\ of\ Land\ Use\ Zone)(Relative\ Impact\ Coefficient)$$

Proportion of land cover/land use is calculated and recorded in Section G-6b(3) by dividing the area classified as each LULC type (*LULCArea*) by the total area of the LULC zone (*LULCZone*).

EXAMPLE:		$\boldsymbol{LULCZone = 187.09}$
LULC Class	*LULCArea*	$Proportion = LULCArea\ /\ LULCZone$
Developed, Open Space	55.97 ha	$Proportion = 55.97\ /\ 187.09 = 0.30$
Developed, Low Intensity	66.99 ha	$Proportion = 66.99\ /\ 187.09 = 0.36$
Developed, Med Intensity	29.98 ha	$Proportion = 29.98\ /\ 187.09 = 0.16$
Developed, High Intensity	2.24 ha	$Proportion = 2.24\ /\ 187.09 = 0.01$
Deciduous Forest	17.11 ha	$Proportion = 17.11\ /\ 187.09 = 0.09$
Woody Wetlands	14.43 ha	$Proportion = 14.43\ /\ 187.09 = 0.08$
Mixed Forest	0.33 ha	$Proportion = 0.33\ /\ 187.09 = 0.00$
Emergent Wetlands	0.04 ha	$Proportion = 0.04\ /\ 187.09 = 0.00$

Sub-scores representing the relative effect of each LULC type are then calculated and recorded in Section G-6b(5) by multiplying the proportion of the land use zone by the relative impact coefficient (*LULCWeight*) for assigned to that type.

$$SubScore = (Proportion)(LULCWeight)$$

The sub-score = 0 for any LULC type(s) not present in the land use zone.

LULC Class	$Proportion$	$LULCWeight$	Relative Effect Sub-Scores
Open Water	-	10	$SubScore = 0$
Perennial Ice/Snow	-	10	$SubScore = 0$
Developed, Open Space	0.30	3	$SubScore = (0.30)(3) = 0.90$
Developed, Low Intensity	0.36	2	$SubScore = (0.36)(2) = 0.72$
Developed, Med Intensity	0.16	1	$SubScore = (0.16)(1) = 0.16$
Developed, High Intensity	0.01	0	$SubScore = (0.01)(0) = 0.00$
Barren (Rock/Sand/Clay)	-	7	$SubScore = 0$
Deciduous Forest	0.09	10	$SubScore = (0.09)(10) = 0.90$
Evergreen Forest	-	10	$SubScore = 0$
Mixed Forest	0.00	10	$SubScore = (0.00)(10) = 0.00$
Scrub Shrub	-	10	$SubScore = 0$
Grassland/Herbaceous	-	10	$SubScore = 0$
Pasture/Hay	-	6	$SubScore = 0$
Cultivated Crops	-	3	$SubScore = 0$
Woody Wetlands	0.08	10	$SubScore = (0.08)(10) = 0.80$
Emergent Wetlands	0.00	10	$SubScore = (0.00)(10) = 0.00$

The sum of the sub-scores determines the score for *LandCov*.

$$LandCov = \sum_{T=1}^{n} \left(\frac{LULCArea_T}{LULCZone}\right)(LULCWeight_T) = \boxed{3.48}$$

The equation for *LandCov* generates a value between 0 and 10. An assessment unit with 100% high intensity development in the land use zone will receive a score of 0.

Scoring: The equation for *LandCov* generates a value between 0 and 10. The score for *Detention* = 0 if the average width of the wetland system is less than 10 meters. The equation for *LandCov* generates a value between 0 and 10. The score for *LandCov* is the sum of the relative effect sub-scores. The score for *LandCov* will be 0 if the 500m land cover zone is entirely comprised of High Intensity Development.

NitrogenBiomass

***NitrogenBiomass* represents the amount of living biomass available for uptake and transformation of nitrogen within the AU.**

Sub-Variables	Description
HerbCov	Areal cover of vegetation in the herbaceous layer
ShrubCov	Areal cover of vegetation in the shrubaceous layer
TreeCov	Areal cover of vegetation in the tree layer

$$\boldsymbol{NitrogenBiomass = \frac{4(HerbCov) + 2(ShrubCov) + (TreeCov)}{7}}$$

Sub-Variables

HerbCov – estimate of the areal cover of vegetation in the herbaceous layer.

Indicators: Areal cover of vegetation in the herbaceous layer (all non-woody plants, regardless of height, including mosses and aquatic bed plants) is recorded by cover class in Section C-1b(1) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the ten *HerbCov* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the cover class recorded at each sub-unit. *HerbCov* sub-unit scores are weighted by area (see Appendix E) to calculate the *NitrogenBiomass* variable score.

ShrubCov – estimate of the areal cover of vegetation in the shrubaceous layer.

Indicators: Areal cover of vegetation in the shrubaceous layer (all woody plants less than 6m in height, regardless of diameter) is recorded by cover class in Section C-1b(2) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the ten *ShrubCov* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the cover class recorded at each sub-unit. *ShrubCov* sub-unit scores are weighted by area (see Appendix E) to calculate the *NitrogenBiomass* variable score.

TreeCov – estimate of the areal cover of vegetation in the tree layer.

Indicators: Areal cover of vegetation in the tree layer (all woody plants 6m or taller, regardless of diameter) is recorded by cover class in Section C-1b(4) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the ten *TreeCov* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the cover class recorded at each sub-unit. *TreeCov* sub-unit scores are weighted by area (see Appendix E) to calculate the *NitrogenBiomass* variable score.

***HerbCov*, *ShrubCov*, and *TreeCov* Classes and Scores (Composite Variable: *NitrogenBiomass*)**							
COVER CLASS	SCORE	COVER CLASS	SCORE	COVER CLASS	SCORE	COVER CLASS	SCORE
None	0	5 – 15%	1	40 – 60%	5	85 – 95%	9
<1% (Trace)	0	16 – 25%	2	61 – 74%	7	> 95%	10
1 – 4%	0	26 – 39%	3	75 – 84%	8		

Application and Calculation

Scope: Used by one function only: stand-alone variable in the Nitrogen Transformation model.

Calculation: When the AU consists of more than one vegetated wetland sub-unit, *NitrogenBiomass* must be weighted by sub-unit area to determine the variable score. See Appendix E for detailed instructions on sub-unit weighting.

Scoring: The equation for *NitrogenBiomass* generates a value between 0 and 10. The score for *NitrogenBiomass* = 0 if the weighted sub-unit average is less than 5% herbaceous cover AND no more than 15% shrubaceous cover AND no more than 15% tree cover.

PlantStress

***PlantStress* represents the impact of plant community stressors in or near the AU.**

Sub-Variables	Description
StressIntensity	Presence and intensity of plant community stressors
StressProportion	Proportion of AU impacted by plant community stressors

$$\boldsymbol{PlantStress} = \min_{\boldsymbol{S}\in\{\boldsymbol{1},\ldots\boldsymbol{n}\}} \sqrt{\boldsymbol{StressIntensity_S} \times \boldsymbol{StressProportion_S}} \quad \text{and } S = \text{ each stressor}$$

Sub-Variables

StressIntensity – the presence and intensity of plant community stressors in or within 100m of the AU.

Indicators: Evidence of any plant community stressors is evaluated and recorded using the intensity scale (below) in Section F-2(1) of the Data Sheet in the field.

Scoring: The *StressIntensity* scale describes the intensity and impact of each plant community stressor. A-D ratings are assigned a numeric score between 1 and 10 (see table below); scores DECREASE as intensity INCREASES. The user notes the score for the intensity rating recorded for EACH listed plant community stressor.

***StressIntensity* Classes and Scores (Composite Variable: *PlantStress*)**		
RATING	DEGREE OF INTENSITY	SCORE
N/A	No evidence of stressor	10
A	Minimal to no impact evident (stressor present, affects aesthetics only)	8
B	Slight impact evident (likely affecting sensitive species)	5
C	Significant impact evident (changing abundances of multiple species)	3
D	Severe impact evident (altering basic community composition)	1

StressProportion – estimate of the proportion of the AU impacted by plant community stressors.

Indicators: The proportion of the AU affected by each observed plant community stressor is estimated and documented in Section F-2(2) of the Data Sheet in the field.

Scoring: Each of the six *StressProportion* classes is assigned a numeric score between 1 and 10 (see table below); scores DECREASE as proportion INCREASES. The user notes the score for the proportion recorded for EACH listed plant community stressor.

***StressProportion* Classes and Scores (Composite Variable: *PlantStress*)**					
PROPORTION	SCORE	PROPORTION	SCORE	PROPORTION	SCORE
Not present	10	10 – 33%	7	67 – 90%	3
< 10%	9	34 – 66%	5	> 90%	1

Application and Calculation

Scope: Used by one function only: stand-alone variable in the Plant Community Integrity model.

Calculation: The impact of each individual plant community stressor is determined by the relationship between the intensity of the stressor and the proportion of the AU affected by that stressor, and is represented by the stressor sub-score in the following equation:

$$SubScore = \sqrt{(Intensity)(Proportion)}$$

The sub-score is calculated for EACH stressor and recorded in Sections F-2(3) of the Data Sheet. A stressor with a HIGH magnitude of disturbance will generate a LOWER Sub-score.

EXAMPLE:		*StressIntensity*	*StressProportion*	**Sub-Score Calculation**
Stressor 1	Value	A (minimal impact)	< 10% affected	$SubScore = \sqrt{(8)(9)} = \mathbf{8.5}$
	Score	**8**	**9**	
Stressor 2	Value	A (minimal impact)	> 90% affected	$SubScore = \sqrt{(8)(1)} = \mathbf{2.8}$
	Score	**8**	**1**	
Stressor 3	Value	B (slight impact)	34-66% affected	$SubScore = \sqrt{(5)(5)} = \mathbf{5.0}$
	Score	**5**	**5**	
Stressor 4	Value	D (severe impact)	> 90% affected	$SubScore = \sqrt{(1)(1)} = \mathbf{1.0}$
	Score	**1**	**1**	

The score for *PlantStress* is equivalent to the LOWEST sub-score which represents the stressor with the GREATEST impact on the AU. In the example above, Stressor 4 has the greatest magnitude of impact and determines the score for *PlantStress*:

$$PlantStress = \min_{S\in\{1,\ldots n\}} \sqrt{StressIntensity_S \times StressProportion_S} = \boxed{\mathbf{1.0}}$$

Scoring: The equation for *PlantStress* generates a value between 1 and 10. The score for *PlantStress* = 1 if there is stressor rated D (severe impact) affecting more than 90% of the AU. An AU with no evidence of plant community stressors within the last 2 years will receive a score of 10.

StemDensity

***StemDensity* represents the density of tree stems rooted in the AU (both live and standing dead).**

Sub-Variables	Description
TreeCount	Total number of tree stems (both live and standing dead)
TotalBA	Total basal area of tree stems (both live and standing dead)

$$\boldsymbol{StemDensity = \sqrt[3]{TreeCount^2 \times TotalBA}}$$

Sub-Variables

TreeCount – estimate of the total number of tree stems rooted in the AU (including standing dead).

Indicators: All trees (including standing dead trees) rooted in a representative 10x10m² plot are counted and recorded in Section C-2c of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field. Trees are defined as all woody plants 6m or taller, regardless of diameter.

Scoring: Each of the seven *TreeCount* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the appropriate class score for number of tree stems recorded at each sub-unit. *TreeCount* sub-unit scores are weighted by area (see Appendix E) to calculate the *StemDensity* variable score.

***TreeCount* Classes and Scores (Composite Variable: *StemDensity*)**							
COUNT CLASS	SCORE	COUNT CLASS	SCORE	COUNT CLASS	SCORE	COUNT CLASS	SCORE
None	0	4 – 6	3	10 – 12	7	> 15	10
1 – 3	1	7 – 9	5	13 – 15	9		

TotalBA – estimate of the total cross-sectional area of trees in the AU (both live and standing dead).

Indicators: The diameter at breast height (DBH) of every tree (including standing dead) rooted in a representative 10x10m² plot, is measured and recorded in Section C-2a(2) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field. DBH measurements are converted to basal area and the total basal area is recorded in Section C-2b(2) of the Data Sheet. Trees are defined as all woody plants 6m or taller, regardless of diameter.

Scoring: Each of the 12 *TotalBA* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the total live basal area recorded at each sub-unit. *TotalBA* sub-unit scores are weighted by area (see Appendix E) to calculate the *StemDensity* variable score.

***TotalBA* Classes and Scores (Composite Variable: *StemDensity*)**							
BASAL AREA	SCORE	BASAL AREA	SCORE	BASAL AREA	SCORE	BASAL AREA	SCORE
No Trees	0	0.0750 – 0.1249	2	0.2250 – 0.2749	5	0.3750 – 0.4249	8
< 0.0250	0	0.1250 – 0.1749	3	0.2750 – 0.3249	6	0.4250 – 0.4749	9
0.0250 – 0.0749	1	0.1750 – 0.2249	4	0.3250 – 0.3749	7	≥ 0.4750	10

Application and Calculation

Scope: *StemDensity* is only used as a sub-variable component of *VelocityReduct*.

Calculation: When the AU consists of more than one vegetated wetland sub-unit, *StemDensity* must be weighted by sub-unit area to determine the variable score. See Appendix E for detailed instructions on sub-unit weighting.

Scoring: The equation for *StemDensity* generates a value between 0 and 10. *StemDensity* = 0 when the weighted sub-unit average tree count is less than 1 (or the total basal area is less than 0.0750).

VelocityReduct

***VelocityReduct* represents the structure formed by vegetation and microtopographic features which contribute to the roughness of the soil surface.**

Sub-Variables	Description
MicroFeat	Presence and density of microtopographic features
Understory	Areal cover of vegetation in the understory layer
StemDensity	Density of tree stems (both live and standing dead)
TreeCount	Total number of tree stems (both live and standing dead)
TotalBA	Total basal area of tree stems (both live and standing dead)

$$\frac{(MicroFeat + Understory + StemDensity) - min(MicroFeat, Understory, StemDensity)}{2}$$

$$StemDensity = \sqrt[3]{TreeCount^2 \times TotalBA}$$

Sub-Variables

Understory – estimate of the areal cover of vegetation in the understory layer.

Indicators: Areal cover of vegetation in the understory layer (all woody plants less than 6m in height AND all non-woody plants, regardless of height, including mosses and aquatic bed plants) is recorded by cover class in Section C-1b(3) of the Data Sheet at EACH Vegetated Wetland Sub-Unit in the field.

Scoring: Each of the ten *Understory* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the score for the cover class recorded at each sub-unit. *Understory* sub-unit scores are weighted by area (see Appendix E) to calculate the *VelocityReduct* variable score.

***Understory* Classes and Scores (Composite Variable: *VelocityReduct*)**							
COVER CLASS	SCORE	COVER CLASS	SCORE	COVER CLASS	SCORE	COVER CLASS	SCORE
None	0	5 – 15%	1	40 – 60%	5	85 – 95%	9
<1% (Trace)	0	16 – 25%	2	61 – 74%	7	> 95%	10
1 – 4%	0	26 – 39%	3	75 – 84%	8		

MicroFeat – estimate of the density of features which contribute to the roughness of the AU.

Indicators: Microfeatures (coarse woody material, boulders and microtopographic changes) are counted along three 30m transects and recorded in Section C-3a of the Data Sheet at each Vegetated Wetlands Sub-Unit in the field.

Scoring: Each of the six *MicroFeat* classes is assigned a numeric score between 0 and 10 (see table below). The user notes the appropriate class for the average of the three transect counts at each sub-unit. *MicroFeat* sub-unit scores are weighted by area (see Appendix E) to calculate the *VelocityReduct* variable score.

***MicroFeat* Classes and Scores (Composite Variable: *VelocityReduct*)**							
AVG COUNT	SCORE	AVG COUNT	SCORE	AVG COUNT	SCORE	AVG COUNT	SCORE
None	0	4 – 6	3	10 – 12	7	> 15	10
1 – 3	1	7 – 9	5	13 – 15	9		

StemDensity – composite variable that represents the density of tree stems rooted in the AU (including standing dead trees).

Calculation: *StemDensity* is calculated by combining the sub-variables *TreeCount* and *TotalBA* for each vegetated wetland sub-unit in the following equation:

$$StemDensity = \sqrt[3]{TreeCount^2 \times TotalBA}$$

Scoring: The equation for *StemDensity* generates a value between 0 and 10.

Application and Calculation

Scope: Stand-alone variable in the Particulate Retention, Surface Water Detention and Storm Surge Reduction models. Also used as a sub-variable component of *Retentionability*

Calculation: *VelocityReduct* is calculated by discarding the lowest scoring sub-variable and finding the average of the remaining two sub-variables. When the AU consists of more than one vegetated wetland sub-unit, *VelocityReduct* must be weighted by sub-unit area to determine the variable score. See Appendix E for detailed instructions on sub-unit weighting.

Scoring: The equation for *VelocityReduct* generates a value between 0 and 10. The score for *VelocityReduct* = 0 if the weighted sub-unit average is less than 5% understory cover AND the average microfeature count is less than 1 AND the weighted sub-unit average tree count is less than 1 (or the total basal area is less than 0.0750).

Retentionability

***Retentionability* represents the combination of features which influence the residence time of surface water in the AU.**

Sub-Variables	Description
Position	Landscape context (geomorphic position) of the AU
FlowRestrict	Presence and characteristics of features which impede flow
VelocityReduct	Structural reduction of water velocity
MicroFeat	Presence and density of microtopographic features
Understory	Areal cover of vegetation in the understory layer
StemDensity	Density of tree stems (both live and standing dead)
TreeCount	Total number of tree stems (both live and standing dead)
TotalBA	Total basal area of tree stems (both live and standing dead)

$$\boldsymbol{Retentionability} = \frac{\mathbf{3}\left(\sqrt[3]{\boldsymbol{Position} \times \boldsymbol{FlowRestrict}^{\mathbf{2}}}\right) + \mathbf{2}(\boldsymbol{VelocityReduct})}{\mathbf{5}}$$

$$VelocityReduct = \frac{(MicroFeat + Understory + StemDensity) - min(MicroFeat, Understory, StemDensity)}{\bar{}}$$

and $\quad StemDensity = \sqrt[3]{TreeCount^2 \times TotalBA}$

Sub-Variables

Position – the landscape context (geomorphic position or location) of the AU

Indicators: Landscape position is evaluated remotely before the site visit and then confirmed and recorded in Section D-1b of the Data Sheet at EACH Soil Examination Area in the field.

Scoring: Each of the 12 *Position* value options is assigned a numeric score between 1 and 10 (see table below). The user notes the score for landscape position value recorded at each SEA. The SEA value with the HIGHEST score (optimal landscape position for retention of surface water and waterborne matter) is used as the sub-variable score.

***Position* Values and Scores (Composite Variable: *Retentionability*)**					
VALUE	SCORE	VALUE	SCORE	VALUE	SCORE
Groundwater Slope	1	Groundwater Depression	10	Marine Fringe	1
Surface Water Slope	1	Surface Water Depression	10	Estuarine Fringe	5
Groundwater Flat	5	River/Stream Fringe	1	Fresh Water Tidal Fringe	5
Surface Water Flat	5	River/Stream Floodplain	7	Lake/Pond Fringe	2

FlowRestrict – the presence and characteristics of features which slow or restrict the passage of surface water through the AU.

Indicators: ALL flow restriction features observed within the AU in the field are recorded in Section E-1 of the Data Sheet.

Scoring: Each of the 23 *FlowRestrict* value options is assigned a numeric score between 1 and 10 (see table below). The user notes the score for each flow restriction feature recorded. The value with highest score (greatest restriction of surface water flow) is used as the sub-variable score.

***FlowRestrict* Values and Scores (Composite Variable: *Retentionability*)**			
VALUE	SCORE	VALUE	SCORE
Open Exchange – Tidal	2	Functional Culvert Present	-
Open Exchange – Non-Tidal	1	Culvert >75% of Channel Width	2
Unrestricted Channel Present	1	Culvert 50-75% of Channel Width	4
Human/Beaver Constructed Dam Present	9	Culvert 25-50% of Channel Width	6
Channel Present – Restricted by Debris Jam	-	Culvert < 25% of Channel Width	8
Channel Restricted by Debris Jam (< 25%)	3	Non-Functional Culvert Present	-
Channel Restricted by Debris Jam (25-50%)	5	Culvert Partially Blocked by Debris	5
Channel Restricted by Debris Jam (50-75%)	7	Culvert Totally Blocked by Debris	10
Channel Restricted by Debris Jam (>75%)	9	Culvert Located too High Above Flow	10
Channel Narrowed by Geology/Structure	-	Tide Gate/Weir Present	-
Channel Width Narrowed (< 25%)	2	Operational	5
Channel Width Narrowed (25-50%)	3	Non-operational (Open)	2
Channel Width Narrowed (50-75%)	4	Non-operational (Closed)	10
Channel Width Narrowed (>75%)	6	Closed System (No Outlet)	10

VelocityReduct – composite variable that represents the structure formed by vegetation and microtopographic features which contribute to the roughness of the soil surface.

Calculation: *VelocityReduct* is calculated by combining the sub-variables *MicroFeat, Understory*, and *StemDensity* for each vegetated wetland sub-unit in the following equation:

$$\frac{(MicroFeat + Understory + StemDensity) - min(MicroFeat, Understory, StemDensity)}{2}$$

Scoring: The equation for *VelocityReduct* generates a value between 0 and 10.

Application and Calculation

Scope: Stand-alone variable in the Nitrogen Transformation, Phosphorus Retention, Removal/ Sequestration of Heavy Metals and Carbon Sequestration models.

Scoring: The equation for *Retentionability* generates a value between 1 and 10.