

# Field Manual for Rapid Ecological Integrity Assessments of Wetlands in Riparian Areas in Maryland: Coastal Plain Version 1.0" Training Module for the Coastal Plain

**Prepared by: Maryland Department of Natural Resources  
For  
Maryland Department of the Environment**

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**Maryland Department of  
the Environment**

# Site Description:

Project/Site Name: _____	City/County: _____	Sampling Date: _____
Assessment Area Name (if >1 AA): _____	Observer(s): _____	
Delineation performed: <input type="checkbox"/> previously <input type="checkbox"/> concurrently		Lat/Long: _____ AA size: _____ units _____
<b>Site Description:</b> (general landscape setting, overview of riparian corridor, presence of braided/multithread system, topography including karst, vegetation patterns, complexity and habitat richness; human and natural disturbance as indicated by spoil piles, beaver activity, dumping, vegetation removal, pest impacts, excessive flow; description of adjacent stream and sources/evidence of water input or alterations such as culverts, roads/trails, sediment). Representative site photographs of soil, nearest stream channel and banks, and vegetation are useful to show the features present.		

- Landscape features, dominant vegetation, evidence of human or natural disturbance, nearby stream or other bodies of water
- Record notable features of the site, as well as details regarding the surrounding area
- If it seems irrelevant, write it anyway

# Landscape Assessment for Project Area In- Office Module

# Landscape Assessment for Project Area In Office

## LANDSCAPE ASSESSMENT FOR PROJECT AREA (Section 3; office and field assessment)

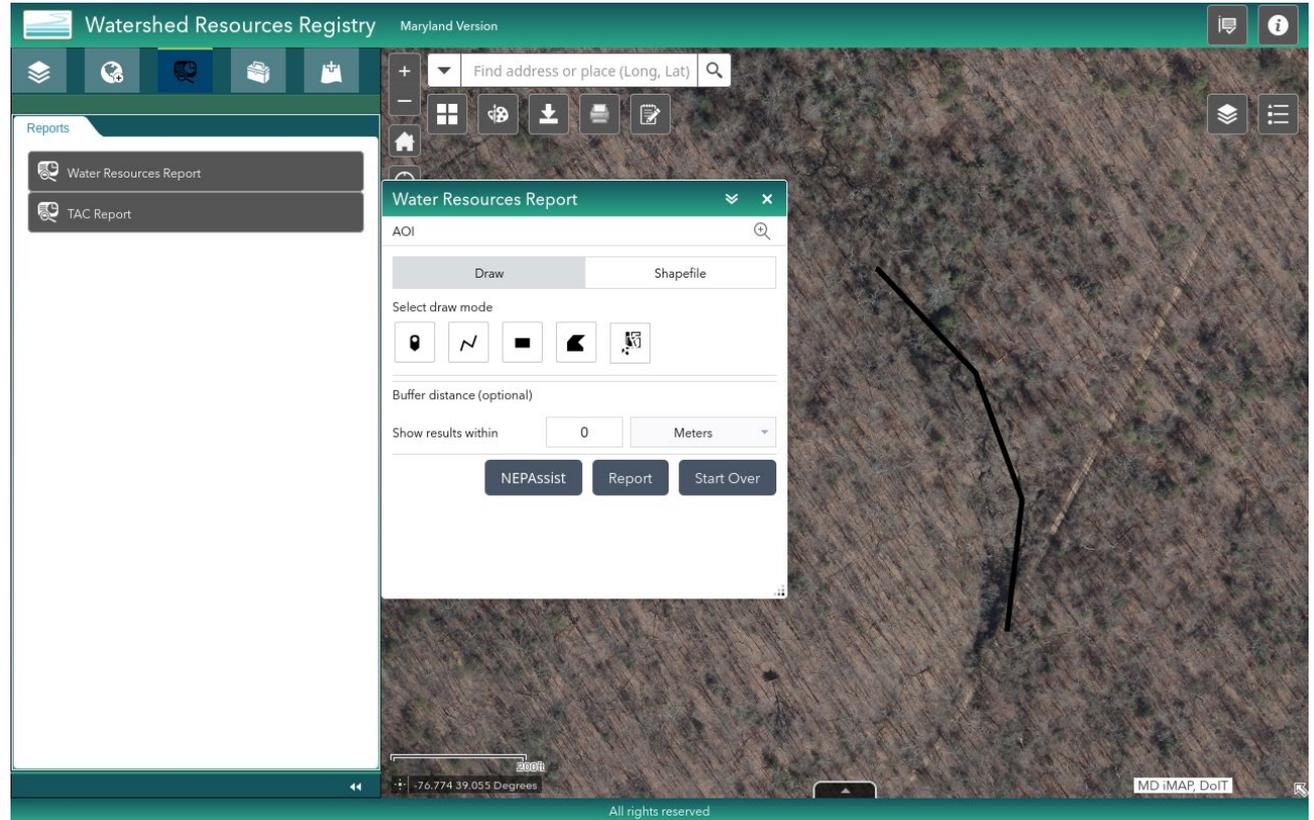
Field observations to assist with scoring of buffers, aquatic context, or size of AA:	
<b>METRIC</b>	<b>SCORE</b> (use Section 3 tables to assign scores)
<i>Buffer Perimeter: %Natural:</i> <input type="checkbox"/> >95% <input type="checkbox"/> 85-95% <input type="checkbox"/> 75-84% <input type="checkbox"/> <75%	
<i>Buffer Condition: %Natural:</i> <input type="checkbox"/> >90% <input type="checkbox"/> 75-90% <input type="checkbox"/> 50-74% <input type="checkbox"/> <50%	
<i>Aquatic Context:</i> <input type="checkbox"/> 4 or more aquatic resources <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 0-1	
<i>Comparative Size:</i> <input type="checkbox"/> Very large <input type="checkbox"/> Large <input type="checkbox"/> Medium to small <input type="checkbox"/> Small to very small	
Source(s) of size reduction, if any: <input type="checkbox"/> Beaver dam or lodge <input type="checkbox"/> Trail <input type="checkbox"/> Road <input type="checkbox"/> Railroad <input type="checkbox"/> Development <input type="checkbox"/> Agriculture <input type="checkbox"/> Impoundment <input type="checkbox"/> Human-constructed drainage (into or out of wetland) <input type="checkbox"/> Excavation <input type="checkbox"/> Fill <input type="checkbox"/> Groundwater extraction <input type="checkbox"/> Other _____	
From StreamStats: Impervious Surface in project area basin: _____ Forest Cover in project area basin: _____	
Additional channels in project area visible on LiDAR Hillshade image:	

- This portion of the assessment can be done after the field visit in the office
  - Aquatic context can include unmapped water sources such as small seeps and tributaries

# Figure 1. Example Imagery for Use of Watershed Resources Registry (WRR)

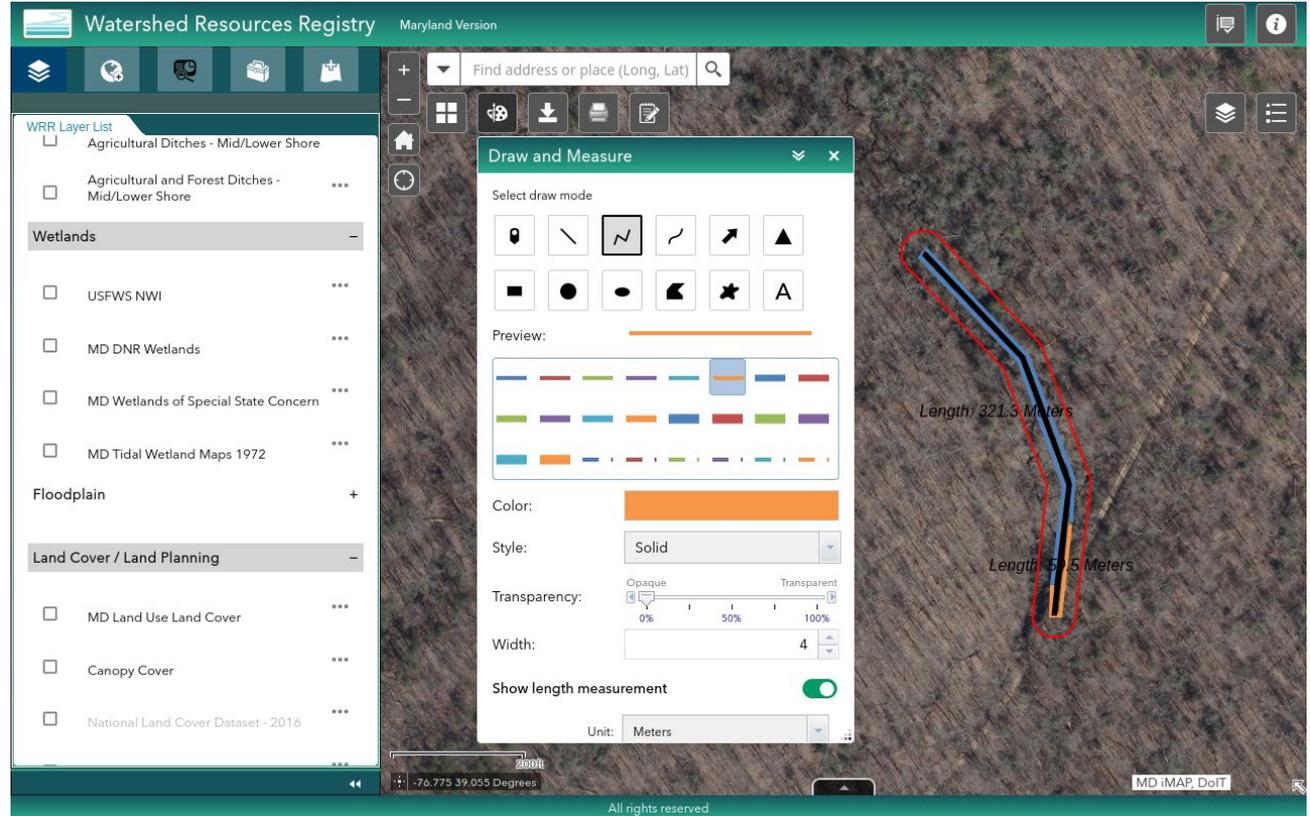
Found at:

<https://watershedresourcesregistry.org/map/?config=stateConfigs/maryland.json>



# Figure 2: Example Imagery for Buffer Perimeter Metric Calculation

- Set the buffer distance to 10 meters.
- Use Table 4. To assign a metric rating as a result of the calculation.



# Table 4. Buffer Perimeter Metric Rating Criteria

**Table 4. Buffer Perimeter Metric Rating Criteria.**

Metric Rating	Rating Criteria
4 = Excellent	Natural buffer is >95% of perimeter
3 = Good	Natural Buffer is 85-95% of AA perimeter
2 = Fair	Natural Buffer is 75-84% of AA perimeter
1 = Poor	Natural Buffer is < 75% of AA perimeter

# Figure 3. Example Imagery for Buffer Condition Metric Calculation

- Set the buffer distance to 100 meters.

The screenshot displays the Watershed Resources Registry (WRR) web application interface. The main map area shows a green landscape with a blue water body and a red buffer around a black line. The interface includes a top navigation bar with the title "Watershed Resources Registry" and "Maryland Version". A search bar is located at the top center. On the left, there is a "WRR Layer List" panel with a "Land Cover / Land Planning" section containing several layers, with "MD Land Use Land Cover" checked. A "Water Resources Report" window is open in the center, showing "AOI" and "Draw" options, with a "Buffer distance (optional)" field. A "Legend" window is also open, listing various land cover categories such as "Very Low Density Residential", "Low Density Residential", "Medium Density Residential", "High Density Residential", "Commercial", "Industrial", "Institutional", "Other Developed Lands", "Agriculture", "Forest", "Water", "Wetlands", and "Barren Land". The bottom of the interface shows a coordinate field with "-76.777 39.060 Degrees" and a footer with "All rights reserved" and "MD iMAP, DoIT | MD iMAP, MDP".

# Table 5. Buffer Condition Metric Rating

**Table 5. Buffer Condition Metric Rating.**

Metric Ratings	Buffer Condition
Excellent = 4	Buffer is characterized by abundant (> 90%) natural cover (Forest, Wetland, or Open Water categories)
Good = 3	Buffer is characterized by substantial (75–90%) natural cover.
Fair = 2	Buffer is characterized by a moderate (50–74%) natural cover.
Poor = 1	Low (< 50%) cover of natural habitats within the buffer.

# Figure 4. Example Imagery for Aquatic Context Metric.

- Set the buffer distance to 300 meters.

The screenshot displays the Watershed Resources Registry (WRR) Maryland Version interface. The main map area shows an aerial view of a landscape with a red circular buffer around a stream. A 'Water Resources Report' dialog box is open, showing 'AOI' and 'Buffer distance (optional)' set to 300 Meters. The 'WRR Layer List' on the left shows 'Rivers and Streams NHD Large Scale' selected under 'Water' and 'MD DNR Wetlands' selected under 'Wetlands'. A tooltip for 'Wetlands - Polygon - Department of Natural Resources: Palustrine' is visible.

Watershed Resources Registry Maryland Version

Find address or place (Long, Lat)

WRR Layer List

Water

- NHDPlus High Resolution
- Rivers and Streams NHD Small Scale
- Rivers and Streams NHD Large Scale
- MD Lakes (Detailed)
- Agricultural Ditches - Mid/Lower Shore
- Agricultural and Forest Ditches - Mid/Lower Shore

Wetlands

- USFWS NWI
- MD DNR Wetlands
- MD Wetlands of Special State Concern
- MD Tidal Wetland Maps 1972

Water Resources Report

AOI

Draw Shapefile

Select draw mode

Buffer distance (optional)

Show results within 300 Meters

NEPAAssist Report Start Over

Wetlands - Polygon - Department of Natural Resources: Palustrine

Class PFO1C

Zoom to

MD iMAP, DNR | MD iMAP, DoIT | U.S. Geological Survey

All rights reserved

# Table 6. Aquatic Context Metric Rating Criteria.

**Table 6. Aquatic Context Metric Rating Criteria.**

Metric Rating	Rating Criteria
Excellent = 4	4 or more types
Good = 3	3 types
Fair = 2	2 types
Poor = 1	0-1 type

# Comparative Size:

- Determine the KWH first, as without it, there is no baseline to draw comparisons from.
- Consult Table 7. Patch Type Definitions for Typical Spatial Patterning of Key Wildlife Habitats
- Then determine a metric score from Table 8. Comparative Size Metric Rating Criteria.
  - Use Table 13 for lists of Indicator Species by KWH and consider any evidence from the site or other resources to indicate whether the wetland has been reduced in size due to human activities resulting in conversion or disturbance.

# StreamStats

Basin Characteristics can be edited here

 Calculate Missing Parameters

Parameter	Value
FOREST	73.8
IMPERV	7.88

Found at: <https://streamstats.usgs.gov/ss/>

# Completed Landscape Example

## LANDSCAPE ASSESSMENT FOR PROJECT AREA (Section 3; office and field assessment)

Field observations to assist with scoring of buffers, aquatic context, or size of AA:	
<b>METRIC</b>	<b>SCORE</b> (use Section 3 tables to assign scores)
Buffer Perimeter: %Natural: <input type="checkbox"/> >95% <input type="checkbox"/> 85-95% <input checked="" type="checkbox"/> 75-84% <input type="checkbox"/> <75%	2
Buffer Condition: %Natural: <input checked="" type="checkbox"/> >90% <input type="checkbox"/> 75-90% <input type="checkbox"/> 50-74% <input type="checkbox"/> <50%	4
Aquatic Context: <input checked="" type="checkbox"/> 4 or more aquatic resources <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 0-1	4
Comparative Size: <input type="checkbox"/> Very large <input checked="" type="checkbox"/> Large <input type="checkbox"/> Medium to small <input type="checkbox"/> Small to very small	3
Source(s) of size reduction, if any: <input type="checkbox"/> Beaver dam or lodge <input type="checkbox"/> Trail <input checked="" type="checkbox"/> Road <input type="checkbox"/> Railroad <input type="checkbox"/> Development <input type="checkbox"/> Agriculture <input type="checkbox"/> Impoundment <input type="checkbox"/> Human-constructed drainage (into or out of wetland) <input type="checkbox"/> Excavation <input type="checkbox"/> Fill <input type="checkbox"/> Groundwater extraction <input type="checkbox"/> Other _____	
From StreamStats: Impervious Surface in project area basin: <u>8.04</u> Forest Cover in project area basin: <u>73.3</u>	
Additional channels in project area visible on LiDAR Hillshade image: <u>No</u>	

- Now put it all together!

# Office Landscape Assessment Module Conclusion

- In this module you learned:
  - What the data sheet looks like.
  - How and where to enter the appropriate data.
  - Using Watershed Resources Registry and where the appropriate functions are.
  - Using StreamStats for the purposes of this assessment.
  - How the data is translated into the appropriate score.

# Wetland Assessment Area Only: Environmental Information Module

# Environmental Information

## Wetland Assessment Area Only - Landscape Position:

### WETLAND ASSESSMENT AREA ONLY:

#### **ENVIRONMENTAL INFORMATION** (Section 4.2)

Slope (deg/%): \_\_\_\_\_ Aspect (if applicable): \_\_\_\_\_

Landscape Position: Indicate all features present

<input type="checkbox"/> Active floodplain (depression or terrace)	<input type="checkbox"/> Beaver pond/Natural impoundment	<input type="checkbox"/> Riparian-Depression (in floodplain)	<input type="checkbox"/> Riparian terrace (outside seasonal flooding; historic floodplain or current terrace)
<input type="checkbox"/> Headwater stream/spring	<input type="checkbox"/> Saddle/Drainage Divide	<input type="checkbox"/> Swale	<input type="checkbox"/> Isolated Depression
<input type="checkbox"/> Oxbow	<input type="checkbox"/> Seep/groundwater discharge site	<input type="checkbox"/> Streambank	<input type="checkbox"/> Point bar
<input type="checkbox"/> Flats	<input type="checkbox"/> Wetland charged by groundwater seeps	<input type="checkbox"/> Braided channels	<input type="checkbox"/> Other- describe

- What landform(s) best describe the assessment area?
  - Include all observed landforms, and if there is a feature not listed above, include in the “other” category.

# Environmental Information

## Wetland Assessment Area Only

### Water Source:

Water Source: If more than one source is present, label as P (primary), S (Secondary), T (tertiary)

<input type="checkbox"/> Direct precipitation	<input type="checkbox"/> Groundwater discharge	<input type="checkbox"/> Natural surface flow	<input type="checkbox"/> Urban run-off/culverts
<input type="checkbox"/> Overbank flooding	<input type="checkbox"/> Alluvial aquifer	<input type="checkbox"/> Irrigation	<input type="checkbox"/> Pipes/outfall (directly feeding wetland)

- What is/are the primary, secondary, and tertiary water source(s) for the wetland?
  - Not all sites will have more than one source
  - Rank with a P (primary), S (secondary), and T (tertiary)
    - If unsure, or stuck between options, do your best and make a call, but note the reason for any uncertainty in the site description or in the remarks section

# Environmental Information Wetland Assessment Area Only Hydrological Regime:

Hydrological Regime: Circle the regime that best matches the conditions in the AA

H Permanently Flooded	G Intermittently Exposed	F Semipermanently Flooded	C Seasonally Flooded	E Seasonally Flooded-Saturated
B Seasonally Saturated	D Continuously Saturated	A Temporarily Flooded	I Intermittently Flooded	K Artificially Flooded

- Be mindful of recent rainfall or drought
- It may be helpful to dig up a soil sample before this part of the assessment
  - Consider surface and groundwater levels, vegetation, and soil characteristics (if not relict) in assigning the water regime.

# Environmental Information

## Wetland Assessment Area Only Example:



# Environmental Information

## Wetland Assessment Area Only Example Cont:

### WETLAND ASSESSMENT AREA ONLY:

#### ENVIRONMENTAL INFORMATION (Section 4.2)

Slope (deg/%): \_\_\_\_\_ Aspect (if applicable): \_\_\_\_\_

Landscape Position: Indicate all features present

<input type="checkbox"/> Active floodplain (depression or terrace)	<input type="checkbox"/> Beaver pond/Natural impoundment	<input type="checkbox"/> Riparian-Depression (in floodplain)	<input checked="" type="checkbox"/> Riparian terrace (outside seasonal flooding; historic floodplain or current terrace)
<input type="checkbox"/> Headwater stream/spring	<input type="checkbox"/> Saddle/Drainage Divide	<input type="checkbox"/> Swale	<input checked="" type="checkbox"/> Isolated Depression
<input type="checkbox"/> Oxbow	<input type="checkbox"/> Seep/groundwater discharge site	<input type="checkbox"/> Streambank	<input type="checkbox"/> Point bar
<input checked="" type="checkbox"/> Flats	<input type="checkbox"/> Wetland charged by groundwater seeps	<input type="checkbox"/> Other- describe	

Water Source: If more than one source is present, label as P (primary), S (Secondary), T (tertiary)

<input checked="" type="checkbox"/> <b>S</b> Direct precipitation	<input type="checkbox"/> <b>P</b> Groundwater discharge	<input type="checkbox"/> Natural surface flow	<input type="checkbox"/> Urban run-off/culverts
<input checked="" type="checkbox"/> <b>T</b> Overbank flooding	<input type="checkbox"/> Alluvial aquifer	<input type="checkbox"/> Irrigation	<input type="checkbox"/> Pipes/outfall (directly feeding wetland)

Hydrological Regime: Circle the regime that best matches the conditions in the AA

H Permanently Flooded	G Intermittently Exposed	F Semipermanently Flooded	C Seasonally Flooded	E Seasonally Flooded-Saturated
<b>B Seasonally Saturated</b>	D Continuously Saturated	A Temporarily Flooded	I Intermittently Flooded	K Artificially Flooded

# Environmental Information Module Conclusion

- In this module you learned how:
  - To fill out the data sheet with the appropriate landscape positions
  - Determining the water source and what to do in the event that the primary water source is not abundantly clear
  - Indicating the hydrological regime, and ensuring to take the appropriate pictures and notes in order to defend your choice in the event that the regime may be difficult to determine.

# Classification of Habitat Module

# Classification of Habitat

## **CLASSIFICATION OF AA TO KEY WILDLIFE HABITAT AND HGM CLASS** (Section 4.3)

Key Wildlife Habitat: \_\_\_\_\_ HGM Class: \_\_\_\_\_

Optional: NVC Community Type/Plant Association: \_\_\_\_\_

Stream Key Wildlife Habitat Type:  Coastal Plain Stream  Blackwater Stream  Coastal Plain River

- Use key from page 26 to determine KWH, and each KWH will generally line up with a specific HGM class
- If available, include NVC Community Type/Plant Association

# Table 12: Coastal Plain

**Table 12: Maryland Key Wildlife Habitat Classification Key for non-tidal wetland habitats of the Upper Coastal Plain, including HGM Class.** For descriptions and examples of KWH, see Appendix

1. HGM classes are defined in Smith et al., 1995.

1a. Wetlands bordering streams and rivers with overland, non-tidal flooding regimes (i.e., floodplains). Distinct alluvial landforms (e.g., backswamps, levees, terraces) and indicators present (e.g., scour marks, recent sediment deposition, vegetation damaged/bent in one direction, soils with alternating deposits, channel banks with flood marks). Likely to be 3<sup>rd</sup> order and higher. Structurally and compositionally diverse vegetation present ranging from closed mixed forests to open, beaver-created pools with floating aquatics.....**COASTAL PLAIN FLOODPLAIN** HGM Class: Riverine

1b. Wetlands primarily controlled via groundwater discharge often associated with depressional and slope geomorphic features as well as the margins of small stream (1<sup>st</sup> and 2<sup>nd</sup> order) floodplain wetlands.

2a. Wetlands associated with toe slopes and floodplains of small streams of the coastal plain where groundwater discharge is a major contributing input source (mixed hydrological regime: occurs in very narrow part of the groundwater driven complex that is influenced by overbank flooding) with alluvial landform a minor part of the complex; smaller order stream floodplain margins where groundwater input also contributes to overall hydrology. These areas are generally small features along streams and are usually not as well-developed as seepage swamps in larger stream systems.....**COASTAL PLAIN FLOODPLAIN** HGM Class: Riverine or Slope

2b. Wetlands associated with distinct depressional and slope geomorphic features.

3a. Basin wetlands, depressions, or very flat areas with evidence of ponded water, unidirectional flow not evident, lacks natural outlet, maintained by high water tables and seasonal precipitation. Hydrologic regimes range from saturated to seasonally flooded.

4. Seasonally flooded to saturated forested flats and depressions of broad coastal plain terraces (i.e., "wet flatwoods") with fluctuating water levels and intermittently ponded depressions. Soils are silt, sand, and clay loams, sometimes with a thin (< 30 cm [12 in]) mantle of coarse, fibric peat.

5a. Located on flat terraces and shallow depressions with seasonally perched water tables and braided channels..... **COASTAL PLAIN FLATWOOD AND DEPRESSION SWAMP** Flatwood: HGM Class- Flat; Depression Swamp: HGM Class- Depression

5b. Small (<0.1 ha- 2 ha) shallow pools with a well-defined, discrete basin overlying a clay hardpan or other impermeable soil or rock layer impeding drainage, may or may not have vegetation in basin.....**VERNAL POOL** HGM Class: Depression

3b. Slope wetlands associated with groundwater discharge zones (i.e., seeps, springs) and perennial, unidirectional flow towards a natural outlet such as a stream.

6a. Small (usually <1m<sup>2</sup>), localized area of groundwater discharge, point source, generally mountain and piedmont regions only.....**SPRING** HGM Class: Slope

6b. Larger wetland systems with diffuse drainage patterns, widespread.

7a. Open wetlands characterized by predominately shrub and herbaceous vegetation and localized groundwater discharge zones. (*note. Lack of natural disturbances [e.g., fire, beaver activity, grazing] in these habitats often promote woody plant succession.*) Saturated "bog-like" wetlands along gently sloping headwater streams, seepage toe-slopes, and oligotrophic spring-heads with considerable accumulation of peat mosses (*Sphagnum spp.*) at varying depths, soils acidic and infertile (*note. The term "bog" applied here is a technical misnomer since none of these wetland systems in Maryland are ombrotrophic.*).....**COASTAL PLAIN SEEPAGE BOG AND FEN** HGM Class: Organic Soil Flat; Slope

7b. Saturated forests of sloping stream headwaters, large spring seeps, lateral seeps in ravines and stream bottoms with diffuse drainage patterns. Braided stream channels, muck-filled depressions, and hummock-and-hollow microtopographic features evident.....**COASTAL PLAIN SEEPAGE SWAMP** HGM Class: Slope

# Coastal Plain Floodplain



# Coastal Plain Seepage Swamp



# Coastal Plain Flatwood and Depression Swamp



Spring



# Vernal Pool



# Coastal Plain KWH Classification Example:

- This is wetland is in the Coastal Plain along Pusey Branch.
  - It is a Blackwater system.
  - There are patches of Sphagnum and other mosses.
  - The water table is almost at the surface.



# Coastal Plain KWH Example:

**Table 12: Maryland Key Wildlife Habitat Classification Key for non-tidal wetland habitats of the Upper Coastal Plain, including HGM Class.** For descriptions and examples of KWH, see Appendix

1. HGM classes are defined in Smith et al., 1995.

1a. Wetlands bordering streams and rivers with overland, non-tidal flooding regimes (i.e., floodplains). Distinct alluvial landforms (e.g., backswamps, levees, terraces) and indicators present (e.g., scour marks, recent sediment deposition, ~~vegetation damaged/bent in one direction~~, ~~soils with alternating deposits~~, channel banks with flood marks). Likely to be 3<sup>rd</sup> order and higher. Structurally and compositionally diverse vegetation present ranging from closed mixed forests to open, beaver-created pools with floating aquatics.....~~COASTAL PLAIN FLOODPLAIN~~ HGM Class: Riverine

1b. Wetlands primarily controlled via groundwater discharge often associated with depressional and slope geomorphic features as well as the margins of small stream (1<sup>st</sup> and 2<sup>nd</sup> order) floodplain wetlands.

2a. Wetlands associated with toe slopes and floodplains of ~~small streams~~ of the coastal plain where groundwater discharge is a major contributing input source (mixed hydrological regime: occurs in very narrow part of the groundwater driven complex that is influenced by overbank flooding) with alluvial landform a minor part of the complex; smaller order stream floodplain margins where groundwater input also contributes to overall hydrology. These areas are generally small features along streams and are usually not as well-developed as seepage swamps in larger stream systems......~~COASTAL PLAIN FLOODPLAIN~~ HGM Class: Riverine or Slope

2b. Wetlands associated with distinct depressional and slope geomorphic features.

3a. Basin wetlands, depressions, or very flat areas with evidence of ponded water, unidirectional flow not evident, lacks natural outlet, maintained by high water tables and seasonal precipitation. Hydrologic regimes range from saturated to seasonally flooded.

4. ~~Seasonally flooded to saturated forested flats and depressions of broad coastal plain terraces~~ (i.e., "wet flatwoods") with fluctuating water levels and intermittently ponded depressions. Soils are silt, sand, and clay loams, sometimes with a thin (< 30 cm [12 in]) mantle of coarse, fibric peat.

5a. Located on flat terraces and shallow depressions with ~~seasonally perched water tables and braided channels~~..... ~~COASTAL PLAIN FLATWOOD AND DEPRESSION SWAMP~~ Flatwood: HGM Class- Flat; Depression Swamp: HGM Class- Depression

5b. Small (<0.1 ha- 2 ha) shallow pools with a well-defined, discrete basin overlying a clay hardpan or other impermeable soil or rock layer impeding drainage, may or may not have vegetation in basin.....~~VERNAL POOL~~ HGM Class: Depression

3b. Slope wetlands associated with groundwater discharge zones (i.e., seeps, springs) and perennial, unidirectional flow towards a natural outlet such as a stream.

6a. Small (usually <1m<sup>2</sup>), localized area of groundwater discharge, point source, generally mountain and piedmont regions only.....~~SPRING~~ HGM Class: Slope

6b. Larger wetland systems with diffuse drainage patterns, widespread.

7a. Open wetlands characterized by ~~predominately shrub~~ and herbaceous vegetation and localized groundwater discharge zones. (note. Lack of natural disturbances [e.g., fire, beaver activity, grazing] in these habitats often promote woody plant succession.) Saturated "bog-like" wetlands along gently sloping headwater streams, seepage toe-slopes, and oligotrophic spring-heads with considerable accumulation of peat mosses (*Sphagnum spp.*) at varying depths, soils acidic and infertile (note. The term "bog" applied here is a technical misnomer since none of these wetland systems in Maryland are ombrotrophic.).....~~COASTAL PLAIN SEEPAGE BOG AND FEN~~ HGM Class: Organic Soil Flat; Slope

7b. Saturated forests of sloping stream headwaters, large spring seeps, lateral seeps in ravines and stream bottoms with diffuse drainage patterns. Braided stream channels, muck-filled depressions, and hummock-and-hollow microtopographic features evident.....~~COASTAL PLAIN SEEPAGE SWAMP~~ HGM Class: Slope

# Coastal Plain KWH Classification Example:

## CLASSIFICATION OF AA TO KEY WILDLIFE HABITAT AND HGM CLASS (Section 4.3)

Key Wildlife Habitat: Coastal Plain Seepage Swamp HGM Class: Riverine

Optional: NVC Community Type/Plant Association: \_\_\_\_\_

Stream Key Wildlife Habitat Type:  Coastal Plain Stream  Blackwater Stream  Coastal Plain River

- If applicable, include the NVC Community Type/Plant Association
- Note the stream type
  - In this case it is a Blackwater Stream

# KWH Classification Module Conclusion

- In this module you learned how:
  - To use Figure 12. In the manual to determine the appropriate Key Wildlife Habitat and HGM Class.
  - What various KWH's may look like in the Coastal Plain using the photos in this presentation.
  - What the data looks like, as well as noting the Stream Key Wildlife Habitat.

# Soil/Substrate Module

# Soil/Substrate

## SOIL/SUBSTRATE (Section 4.4)

Note: if the floodplain does not naturally have hydric soils, and still does not have hydric soils under current conditions, only score Microtopography, Organic Matter Accumulation, and Soil Disturbance.

Mapped Soil Type: \_\_\_\_\_ Depth to water table \_\_\_\_\_ Hydric soil? \_\_\_ Hydric Soil Indicators: \_\_\_\_\_

Depth of O horizon \_\_\_\_\_ Depth of A horizon \_\_\_\_\_ Extensive roots in soil? \_\_\_\_\_ Gravel substrate present? \_\_\_\_\_ Matrix/Chroma \_\_\_\_\_

Note any deviations from the characteristics described for the mapped soil type for this AA and potential causes. Describe any impacts to the soil surface such as trampling/compaction from animals or machinery, ruts or other disturbances from ATV or other vehicular activity, or sedimentation.

Observations/Comments (including for metrics below):

- Record the mapped soil type, and note if it appears to conflict with your in-field assessment.
- Dig the hole for the water table measurement and measure the depth after approximately 20-30 minutes.

# Soil/Substrate

**Redox concentrations:**  >10% surface area and  start 0-6" from soil surface  start >6-12"  start >12-18"  
 <10% surface area and  start 0-6" from soil surface  start >6-12"  None within 18" **Score:** \_\_\_\_\_

**Soil Organic Matter:**  Horizon present (any thickness)  Mineral surface layer(s)  $\geq 4"$  thick with Matrix value  $\leq 3$  and chroma  $\leq 2$   
 Mineral surface layer  $< 4"$  thick and  Matrix value  $\leq 3$  and chroma  $\leq 2$   Matrix value  $> 3$  and  $\leq 4$  or chroma  $> 2$  and  $\leq 3$  **Score:** \_\_\_\_\_

**Microtopography:**   $\geq 50\%$  of Assessment Area  30-49% of AA  10-29% of AA   $< 10\%$  of AA **Score:** \_\_\_\_\_

**Organic Matter Accumulation:** Estimated ground cover of herbaceous/woody plants (living and dead residue): \_\_\_\_\_ %  
Estimated cover of leaf litter (loose leaves must be at least 1" thick or decaying leaves must have at least 5 stacked layers): \_\_\_\_\_ %  
% herbaceous/woody + % leaf litter:   $> 75\%$    $> 50-74\%$    $> 25-50\%$    $\leq 25\%$  **Score:** \_\_\_\_\_

**Soil Disturbance:** Presence of bare soil due to human activities:  None/minimal  Minor/small patches  Moderate  Substantial  
Extent of impact of disturbance:  None  Minimal  Moderate  Extensive  
Depth of disturbance and ponding/channeling:  None   $< 2"$   2-4", some ponding/channeling   $> 4"$ , ponding/channeling  
**Score:** \_\_\_\_\_

- Dig up a soil sample, break it in half after taking a photo
  - This enables one to view redox accurately
- Soil Organic Matter
- Microtopography
- Organic Matter Accumulation
- Soil disturbance



# Soil/Substrate Scoring Tables

**Table 14. Redox Concentrations Metric Rating Criteria.**

All KWH (Do not score if floodplain does not have hydric soils)	
Score	Assign rating to category with majority of features present
Excellent = 4	Biogeochemical cycling excellent, with redox concentrations starting 0 to 6" from the soil surface and covering >10% of the surface area.
Good = 3	Biogeochemical cycling good, with redox concentrations starting >6" to 12" from the soil surface and covering >10% of the surface area OR redox concentrations start 0-6" from the soil surface and represent <10% of the surface area.
Fair = 2	Biogeochemical cycling fair, with redox concentrations starting >12" to 18" from the soil surface and covering >10% of the surface area OR redox concentrations start >6" to 12" from the soil surface and represent <10% of the surface area.
Poor = 1	Biogeochemical cycling poor, with redox concentrations starting >12" to 18" from the soil surface and covering <10% of the surface area OR no redox concentrations within 18" of the soil surface.

**Table 15. Soil Organic Matter Metric Rating Criteria.**

All KWH (Do not score if floodplain does not have hydric soils)	
Score	Assign rating to category with majority of features present
Excellent = 4	Organic surface horizon present (any thickness).
Good = 3	Mineral surface layer(s) are $\geq 4"$ thick with matrix value $\leq 3$ and chroma $\leq 2$ .
Fair = 2	Mineral surface layer(s) are $< 4"$ thick with matrix value $\leq 3$ and chroma $\leq 2$ .
Poor = 1	Mineral surface layer(s) are $< 4"$ thick with matrix value $> 3$ and $\leq 4$ or chroma $> 2$ and $\leq 3$ .

# Soil/Substrate Scoring Tables

**Table 16. Microtopography Metric Rating Criteria.**

Score	Assign rating to category with majority of features present
Excellent = 4	More than 50% of the AA shows at least a 3" increase in elevation over the base elevation of the AA.
Good = 3	30-49% of the AA shows at least a 3" increase in elevation over the base elevation of the AA.
Fair = 2	10-29% of the AA shows at least a 3" increase in elevation over the base elevation of the AA.
Poor = 1	<10% of the AA shows at least a 3" increase in elevation over the base elevation of the AA.

**Table 17. Organic Matter Accumulation Metric Rating Criteria.**

Score	Assign rating to category with majority of features present
Excellent = 4	Organic matter accumulation from root turnover/leaf litter is high as herbaceous and woody plant ground cover plus leaf litter covers >75% of the surface. To count towards coverage, loose leaves must be at least 1" thick or decaying leaves must have at least 5 stacked layers.
Good = 3	Organic matter accumulation from root turnover/leaf litter is moderate as herbaceous and woody ground cover plus leaf litter covers >50-74% of the surface. To count towards coverage, loose leaves must be at least 1" thick or decaying leaves must have at least 5 stacked layers.
Fair = 2	Organic matter accumulation from root turnover/leaf litter is low as herbaceous and woody ground cover plus leaf litter covers >25-50%. To count towards coverage, loose leaves must be at least 1" thick or decaying leaves must have at least 5 stacked layers.
Poor = 1	Organic matter accumulation from root turnover/leaf litter is minimal as herbaceous or woody ground cover plus leaf litter covers <25%. To count towards coverage, loose leaves must be at least 1" thick or decaying leaves must have at least 5 stacked layers.

**Table 18. Soil Disturbance Metric Rating Criteria.**

Score	Assign rating to category with majority of features present
Excellent = 4	Little bare soil OR bare soil and soil disturbed areas are limited to naturally caused disturbances such as flood deposition, game trails, beaver activity, etc. OR soil is naturally bare. No human-caused impacts evident.
Good = 3	Minor amounts or localized, small patches of bare or disturbed soil are present from factors such as cattle trampling or heavy grazing that leads to erosion, compaction or trampling by machinery, ruts or other disturbances from ATV or other vehicular activity, sedimentation due to human causes, or invasive earthworms. Extent of impact is minimal and greatest depth is limited to a few centimeters (a few inches) and does not show evidence of ponding or channeling of water.
Fair = 2	Moderate amounts of bare or disturbed soil are present due to human-caused activities. Extent of impact is moderate and greatest depth may extend 5–10 cm (2–4 inches), with localized deeper ruts. Shows some evidence of ponding or channeling of water.
Poor = 1	Substantial amounts of bare or disturbed soil are present due to human-caused activities. Impact is extensive with long-lasting impacts. Greatest depth of impact extends > 10 cm (4 inches); deeper ruts may be widespread and show some evidence of extensively altering hydrology (e.g., ponding or channeling of water).

# Soil Examples



# Soil/Substrate Example #1:

## SOIL/SUBSTRATE (Section 4.4)

Note: if the floodplain does not naturally have hydric soils, and still does not have hydric soils under current conditions, only score Microtopography, Organic Matter Accumulation, and Soil Disturbance.

Mapped Soil Type: Zekiah sandy loam Depth to water table \_\_\_\_\_ Hydric soil? Hy6 Hydric Soil Indicators: \_\_\_\_\_  
 Depth of O horizon M6A Depth of A horizon \_\_\_\_\_ Extensive roots in soil? 4.5" Gravel substrate present? \_\_\_\_\_ Matrix/Chroma No  
 Note any deviations from the characteristics described for the mapped soil type for this AA and potential causes. Describe any impacts to the soil surface such as trampling/compaction from animals or machinery, ruts or other disturbances from ATV or other vehicular activity, or sedimentation. No  
 Observations/Comments (including for metrics below): 3/4

Streaky redox, sandy texture, decent water table. No obvious odors of decay

**Redox concentrations:**  >10% surface area and  start 0-6" from soil surface  start >6-12"  start >12-18"  <10% surface area and  start 0-6" from soil surface  start >6-12"  None within 18" **Score: 4**

**Soil Organic Matter:**  Horizon present (any thickness)  Mineral surface layer(s)  $\geq 4"$  thick with matrix value  $\leq 3$  and chroma  $\leq 2$   Mineral surface layer  $< 4"$  thick and  Matrix value  $\leq 3$  and chroma  $\leq 2$   Matrix value  $> 3$  and  $\leq 4$  or chroma  $> 2$  and  $\leq 3$  **Score: 1**

**Microtopography:**   $> 50\%$  of Assessment Area  30-49% of AA  10-29% of AA   $< 10\%$  of AA **Score: 4**

**Organic Matter Accumulation:** Estimated ground cover of herbaceous/woody plants (living and dead residue): 80 %  
 Estimated cover of leaf litter (loose leaves must be at least 1" thick or decaying leaves must have at least 5 stacked layers): 30 %  
 % herbaceous/woody + % leaf litter:   $> 75\%$   50-74%  25-50%   $\leq 25\%$  **Score: 4**

**Soil Disturbance:** Presence of bare soil due to human activities:  None/minimal  Minor/small patches  Moderate  Substantial  
 Extent of impact of disturbance:  None  Minimal  Moderate  Extensive  
 Depth of disturbance and ponding/channeling:  None   $< 2"$   2-4", some ponding/channeling   $> 4"$ , ponding/channeling **Score: 4**



- Lots of redox concentration
- Poor organic composition

# Soil/Substrate Example #2:

## SOIL/SUBSTRATE (Section 4.4)

Note: if the floodplain does not naturally have hydric soils, and still does not have hydric soils under current conditions, only score Microtopography, Organic Matter Accumulation, and Soil Disturbance.

Mapped Soil Type: Puckum Muck      Depth to water table \_\_\_\_\_      Hydric soil? 4      Hydric Soil Indicators: \_\_\_\_\_  
 Depth of O horizon Yes      Depth of A horizon Muck, sulfur odor 16"      Sulfur odor 16" in soil? \_\_\_\_\_      Gravel substrate present? \_\_\_\_\_      Matrix/Chroma \_\_\_\_\_  
 Note any deviations from the characteristics described for the mapped soil type for this AA and potential causes. Describe any impacts to the soil surface such as trampling/compaction from animals or machinery, ruts or other disturbances from ATV or other vehicular activity, or sedimentation.  
 Observations/Comments (including for metrics below):

**Sulfur odor, very dark and wet. A lot of organic material in the soil, under an O horizon**

**Redox concentrations:** >10% surface area and  start 0-6" from soil surface  start >6-12"  start >12-18"  
 <10% surface area and  start 0-6" from soil surface  start >6-12"  None within 18"      **Score: 1**

**Soil Organic Matter:**  Horizon present (any thickness)  Mineral surface layer(s) ≥ 4" thick with matrix value ≤3 and chroma ≤2  
 Mineral surface layer <4" thick and  Matrix value ≤3 and chroma ≤2  Matrix value >3 and ≤4 or chroma >2 and ≤3      **Score: 4**

**Microtopography:**  >50% of Assessment Area  30-49% of AA  10-29% of AA  <10% of AA      **Score: 2**

**Organic Matter Accumulation:** Estimated ground cover of herbaceous/woody plants (living and dead residue): 75%  
 Estimated cover of leaf litter (loose leaves must be at least 1" thick or decaying leaves must have at least 5 stacked layers): 10%  
 % herbaceous/woody + % leaf litter:  >75%  >50-74%  >25-50%  ≤25%      **Score: 4**

**Soil Disturbance:** Presence of bare soil due to human activities:  None/minimal  Minor/small patches  Moderate  Substantial  
 Extent of impact of disturbance:  None  Minimal  Moderate  Extensive      **Score: 4**  
 Depth of disturbance and ponding/channeling:  None  <2"  2-4", some ponding/channeling  >4", ponding/channeling      **Score: \_\_\_\_\_**



- No redox concentrations? No problem!

# Soil/Substrate Conclusion

- In this module you learned:
  - What soil metrics are important/required to complete this assessment.
  - The appropriate method for determining the depth to the water table.
  - How soil can be used to determine biochemical cycling.
  - Soil redox concentrations as clues to the hydroperiod, and how a lack of redox concentrations are not indicative of a poor soil, it is dependent on other features.
  - The appearance of a completed soil/substrate section.

# Hydrology Module

# Hydrology

## Water Source:

### HYDROLOGY (Section 4.5)

**Water Source**– Identify dominant water source and natural/unnatural influence for the AA by KWH type.

**Natural:**  Sheet flow present  Natural narrow channel present  Mimics natural hydrology  Groundwater input  Expected overbank flooding  
 Expected plant community  Other \_\_\_\_\_

**Unnatural/Manipulated:**  Impoundment  Inflow from anthropogenic sources  Fill  Ditching  Channelization  Confined to small outlet  Lost water sources due to alterations  Multiple sources and some degraded  Incised and no longer floods  Other \_\_\_\_\_

**Point Source Discharge** (into or adjacent to site):  Lacking  Minor  Moderate  Major

**Unnatural Obstructions** (to ground or surface water):  None  Minor (<25%)  Moderate (25-75%)  Major (>75%)

**Alteration to:**  Overland Flow  Groundwater  Overbank Flooding  Plant Community  Wetland Extent input

Timing:  Recent (within 5 years)  Historic  Permanent hydrologic change

Negative effect:  AA Flow and circulation  Redirects or confines flows into/through AA  Reduced water table  Reduced inundation  None

Score: \_\_\_\_\_

- Determine if the water source is natural
- Identify disturbances which affect the hydrology
- Degree of point source discharge which could be polluting the water entering the site



# Hydrology - Channel:

**Stream Bank and Channel** – Describe the stream channel in the project area, including evidence of alteration and signs of recovery/stabilization.

**Evidence of bank/channel equilibrium:**  Recovering to meander  Low energy stream with bare banks  Variety of pool depths  Variety of stream velocities  Visual flow of water from channel banks or wetlands (groundwater flow)  Still pools with some flow and floodplain connection  Embedded woody debris of size and amount consistent with what is available in riparian area  Well-defined usual high water line with obvious floodplain  Little or no active undercutting or burial of riparian vegetation  Braided channels  Other \_\_\_\_\_

**Evidence of channel instability/migration:**  Riparian vegetation buried  Recent sediment or gravel deposited  Active incision/downcutting  Braided channels have coalesced  Other \_\_\_\_\_

**Overall channel instability:**  None/minimal  Minor  Moderate  Substantial

**Sources of channel instability/migration:**  Lacks vertical controls (vegetation, wood, rock, etc.)  Excessive channel deposition/bar development  Historic channel alteration  Proximity and landscape position presents potential impact to AA hydrology  Other \_\_\_\_\_

**Evidence of bank instability:**  Banks undercut, slides, and/or slumps  Riparian vegetation declining  Shrub/trees falling into channel  Bank uniformly scoured and unvegetated  Other \_\_\_\_\_

**Overall bank instability:**  None/minimal  Minor  Moderate  Substantial

**Sources of bank instability:**  Vertical banks  Highly erodible materials  Raw unvegetated banks  Excessive bedload  Other \_\_\_\_\_

If available: Bank Erosion Hazard Index \_\_\_\_\_ Near Bank Stress \_\_\_\_\_ **Score:** \_\_\_\_\_

**Aquatic Life:** (if available; use nearest, most recent Biological Stream Survey point in stream):

Benthic IBI- Value \_\_\_\_\_ Rating:  Good ( $\geq 4$ )  Fair (3-3.99)  Poor  $<3$  Fish IBI- Value \_\_\_\_\_ Rating:  Good ( $\geq 4$ )  Fair (3-3.99)  Poor  $<3$

**Observations/Comments:** \_\_\_\_\_

- Note stability
  - Both channel and banks
- Prior restoration projects?
- Impacted by a culvert?



# Hydrology

## Hydroperiod and Hydrologic Connectivity:

**Hydroperiod and Hydrologic Connectivity** – Determine the natural variability and/or recent alteration of the duration, frequency, and magnitude of inundation/saturation in the AA by KWH type.

**Natural variation of hydroperiod:**  Low  High

Information Sources:  Visual indicators  Monitoring Wells  Hydrology/Hydraulic analysis  Bank Height Ratio \_\_\_\_\_ Entrenchment Ratio \_\_\_\_\_

**Overbank flooding** (if available):  2-year storm  10-year  100-year

**Degree of connection to floodplain:**  Complete **Disconnection/entrenchment:**  Minimal  Moderate  Disconnected and/or severely entrenched

**Evidence of overbank flooding:**  Recent  Evidence of overbank flooding  Some evidence, likely during large storm events  Generally no longer occurs

**Change/Alteration of hydroperiod:**  None  Due to natural events  Due to human influences:  Minor  Moderate  Substantial

Backwater flooding or lateral movement affected by restrictions: List restrictions: \_\_\_\_\_

Score: \_\_\_\_\_

- Redox concentrations or depletions? Can be a helpful indicator, but beware!
  - Lots of redox in soil may not reflect current hydrologic conditions.
  - No apparent redox can be an indicator of a low variation in hydroperiod.

# Hydrology Scoring Tables: Water Source

**Coastal Plain Floodplain:** Groundwater discharge not a major input. For scoring, note stream bank alterations that will affect the riparian water source.

Score	Assign rating to category with majority of features present:	SCORE _____
Excellent = 4	Water source is natural. Lacks point charge discharges into or adjacent to the site. No unnatural obstructions to water source or impact on overland flow and overbank flooding. Plant community reflective of characteristic KWH or not altered by natural changes to water source.	
Good = 3	Water source is mostly natural, but wetland directly receives occasional or small amounts of inflow from anthropogenic sources such as some road runoff, small storm drains, or other minor point source discharges emptying into the wetland. Up to 25% of stream banks are affected due to dikes, rip rap and/or elevated culverts, or there is increased discharge due to other causes. Little change in plant community resulting from unnatural alterations.	
Fair = 2	Water sources are moderately impacted by anthropogenic sources but are still a mix of natural and non-natural sources. Between 25-75% of stream banks are affected (e.g., dikes, rip rap, concrete, and elevated culverts) or increased discharge due to other causes. Wetlands still present due to groundwater or other water inputs, but potentially reduced in extent and showing some plant community changes; or plant community changes due to increased unnatural water inputs.	
Poor = 1	Water source contains a substantial amount of inflow from anthropogenic sources, such as major point source discharges into or adjacent to the wetland. > 75% of stream banks are affected (for example due to dikes, rip rap, concrete, and elevated culverts) or increased discharge due to other causes. Wetlands are reduced in extent unless high groundwater or other surface water inputs maintain them. Plant community changes are observed due to unnatural water inputs.	

# Hydrology Scoring Tables: Water Source

Coastal Plain Floodplain: Mixed hydrologic regime	
Score	Assign rating to category with majority of features present
Excellent = 4	Water source is natural. Lacks point charge discharges into or adjacent to the site. No unnatural obstructions to lateral or vertical movement of ground or surface water. Plant community reflective of characteristic KWH or not altered by natural changes to water source.
Good = 3	Water source is mostly natural, but wetland directly receives occasional or small amounts of inflow from anthropogenic sources such as some road runoff, small storm drains, or other minor point source discharges emptying into the wetland. Minor restrictions to the lateral or vertical movement of ground or surface waters by unnatural features. Little change in plant community resulting from unnatural alterations.
Fair = 2	Water sources are moderately impacted by anthropogenic sources, but are still a mix of natural and non-natural sources. Wetland is still connected to its natural water source (e.g., modified ponds on a floodplain that are still connected to alluvial aquifers, natural stream channels that now receive substantial irrigation return flows, many small/few large storm drains), but moderately disconnected from floodplain due to multiple geomorphic modifications. Moderate restrictions to the lateral or vertical movement of ground or surface waters by unnatural features. Wetlands still present due to groundwater or other water inputs, but limited reduction in extent and showing some plant community changes; or some limited plant community changes due to increased unnatural water inputs.
Poor = 1	Water source contains a substantial amount of inflow from anthropogenic sources, such as major point source discharges into or adjacent to the wetland. Wetland has reduced connection to natural water source (e.g., loss of overbank flow). Wetlands are potentially reduced in extent if no other surface water inputs maintain them. Plant community changes are observed due to unnatural water inputs.

# Hydrology Scoring Tables: Water Source

<b>All other KWH:</b> Predominantly groundwater or precipitation water source, with potential limited flooding from small stream in relation to wetlands in riparian system	
<b>Score</b>	<b>Assign rating to category with majority of features present</b>
Excellent = 4	Water source is natural. Lacks point charge discharges into or adjacent to the site. Groundwater or precipitation dominant or only water source; otherwise, no unnatural obstructions to lateral or vertical movement of ground or surface water, or, if perched water table, impermeable soil layer is intact. Plant community reflective of characteristic KWH or not altered by natural changes to water source.
Good = 3	Water source is mostly natural, but wetland directly receives occasional or small amounts of inflow from anthropogenic sources such as some road runoff, small storm drains, or other minor point source discharges emptying into the wetland. Minor restrictions to the lateral or vertical movement of ground or surface waters by unnatural features, such as levees or excessively high banks (less than 25% of the site). If perched, impermeable soil layer partly disturbed. Little change in plant community resulting from water source alterations.
Fair = 2	Water source is moderately impacted by anthropogenic sources, but still a mix of natural and non-natural sources. Moderate restrictions to the lateral or vertical movement of ground or surface waters by unnatural features or alteration. Between 25-75% of the site is restricted by barriers to drainage. If perched, impermeable soil layer moderately disturbed. Drainage back to the wetland is incomplete due to impoundment. Wetlands still present due to groundwater or other water inputs, but limited reduction in extent and showing some plant community changes; or some limited plant community changes due to water source alterations.
Poor = 1	Water source contains a substantial amount of inflow from anthropogenic sources, such as major point source discharges into or adjacent to the wetland. Most or all water stages are contained within artificial banks, levees, or comparable features. Greater than 75% of wetland is restricted by barriers to drainage. If perched, impermeable soil layer strongly disturbed. Wetlands reduced in extent and show plant community changes due to water source alterations.

# Hydrology Tables: Stream Bank and Channel

Stream Bank and Channel in Project Area (score applies to all AA in project area)		
Score	Assign rating to category with majority of features present:	SCORE _____
Excellent = 4	Indicators of channel equilibrium present. Minimal or no evidence of degradation or aggradation leading to channel instability or migration. Bank instability none or minimal. Channel is not unnaturally entrenched. If calculated, BEHI/NBS scores low.	
Good = 3	Minor channel incision. Channel is somewhat entrenched (overbank flow occurs during most floods). Some evidence of degradation or aggradation leading to a minimal level of channel instability or migration. Minor bank instability. If calculated, BEHI/NBS scores low.	
Fair = 2	Channel is incised. Channel is moderately entrenched (overbank flow only occurs during moderate to severe floods, functioning at risk). Uncharacteristic aggradation or degradation is present leading to a moderate level of channel instability or migration. Bank instability moderate. BEHI/NBS scores moderate.	
Poor = 1	Channel is incised. Channel is substantially entrenched (overbank flow never occurs or only during severe floods-not functioning). Channel entirely or extensively disconnected from the floodplain. Bank instability substantial. BEHI/NBS scores high, very high, or extreme.	

# Hydrology Tables: Hydroperiod

<b>Coastal Plain Floodplain</b>	
___ Low natural variation of hydroperiod ___ High natural variation of hydroperiod	
<b>Score</b>	<b>Assign rating to category with majority of features present</b>
Excellent = 4	Evidence of recent overbank flooding. Completely connected to floodplain (backwater sloughs and channels). No major hydrologic stressors present that impact natural hydroperiod or impact due to natural events (e.g., beaver dams). No unnatural obstructions to lateral or vertical movement of ground or surface water.
Good = 3	Evidence of overbank flooding. Minimally disconnected from floodplain. Minor alterations in frequency, levels, or duration of hydroperiod. Minor restrictions to the lateral or vertical movement of ground or surface waters by unnatural features. Flooding at 2-year storm interval.
Fair = 2	Some evidence of overbank flooding, likely during larger storm events. Moderately disconnected from floodplain due to multiple geomorphic modifications. Moderate restrictions to the lateral or vertical movement of ground or surface waters by unnatural features. Moderate flooding at 2-year storm interval.
Poor = 1	Overbank flooding generally no longer occurs. Disconnected from floodplain, likely causing some drainage of groundwater. Flooding may or may not occur at 100-year or greater storm interval.

# Hydrology Tables: Hydroperiod

<b>Other KWH</b>	
___ Low natural variation of hydroperiod ___ High natural variation of hydroperiod	
<b>Score</b>	<b>Assign rating to category with majority of features present</b>
Excellent = 4	Overbank flooding present and recent but not predominant water source to wetland; no or little channel incision or effects on groundwater or other water sources; plant community reflective of characteristic KWH or not altered by changes to hydroperiod.
Good = 3	Evidence of overbank flooding, limited channel incision; hydroperiod with little alterations in frequency, levels, duration due to groundwater and other inputs; with little change in plant community resulting from hydrologic alterations. Flooding at 2-year storm interval.
Fair = 2	Some evidence of overbank flooding, likely during larger storm events, channel is incised, wetlands still present due to groundwater or other water inputs, but limited reduction in extent and showing some plant community changes; or some limited plant community changes due to increased unnatural water inputs. Flooding at 10-year recurrence interval.
Poor = 1	Overbank flooding generally no longer occurs, channel incised resulting in loss of floodplain connectivity and likely causing some drainage of groundwater; wetlands potentially reduced in extent if no other surface water inputs, plant community changes due to change in hydrology. Flooding may or may not occur at 100-year or greater recurrence interval storm.

# Hydrology Example

- The site is a Coastal Plain Floodplain
  - There is a culvert leading out of the site as there is a road south of the wetland.
  - The channel shows no incisions or downcutting.
  - There are no depositions or bars forming.
  - The site has not been recently historically altered, as far as we can tell.
  - The soil structure is mucky and dense.
  - There are no vertical banks, the channel flows freely into the floodplain with no significant impediments.



# Hydrology Example Cont.

- The soil has less than 10% redox concentrations within 6 inches of the surface.
  - The water table is close to the surface
  - There is sediment deposit on vegetation outside the margins of the channel.
  - The site had recent rainfall.
  - There had been a recent storm, resulting in some surface water in more upland areas.



# Hydrology Example Cont 2.

## HYDROLOGY (Section 4.5)

**Water Source** – Identify dominant water source and natural/unnatural influence for the AA by KWH type.

**Natural:**  Sheet flow present  Natural narrow channel present  Mimics natural hydrology  Coldwater spring flow  Groundwater input  Expected overbank flooding  Expected plant community  Other \_\_\_\_\_  
 **Unnatural/Manipulated:**  Impoundment  Inflow from anthropogenic sources  Fill  Ditching  Channelization  Confined to small outlet  Lost water sources due to alterations  Multiple sources and some degraded  Incised and no longer floods  Other \_\_\_\_\_

**Point Source Discharge** (into or adjacent to site):  Lacking  Minor  Moderate  Major

**Unnatural Obstructions** (to ground or surface water):  None  Minor (<25%)  Moderate (25-75%)  Major (>75%)

**Alteration to:**  Overland Flow  Groundwater  Overbank Flooding  Plant Community  Wetland Extent input

Timing:  Recent (within 5 years)  Historic  Permanent hydrologic change

Negative effect:  AA Flow and circulation  Redirects or confines flows into/through AA  Reduced water table  Reduced inundation  None

Score: 3

Observations/Comments:

**Stream Bank and Channel** – Describe the stream channel in the project area, including evidence of alteration and signs of recovery/stabilization.

**Evidence of bank/channel equilibrium:**  Recovering to meander  Low energy stream with bare banks  Variety of pool depths  Variety of stream velocities  Visual flow of water from channel banks or wetlands (groundwater flow)  Embedded woody debris of size and amount consistent with what is available in riparian area  Well-defined usual high water line with obvious floodplain  Little or no active undercutting or burial of riparian vegetation  Other \_\_\_\_\_

**Evidence of channel instability/migration:**  Riparian vegetation buried  Recent sediment or gravel deposited  Active incision/downcutting

Other \_\_\_\_\_

**Overall channel instability:**  None/minimal  Minor  Moderate  Substantial

**Sources of channel instability/migration:**  Lacks vertical controls (vegetation, wood, rock, etc.)  Excessive channel deposition/bar development  Historic channel alteration  Proximity and landscape position presents potential impact to AA hydrology  Other \_\_\_\_\_

**Evidence of bank instability:**  Banks undercut, slides, and/or slumps  Riparian vegetation declining  Shrub/trees falling into channel  Bank uniformly scoured and unvegetated  Other \_\_\_\_\_

**Overall bank instability:**  None  Minimal  Minor  Moderate  Substantial

**Sources of bank instability:**  Vertical banks  Highly erodible materials  Raw unvegetated banks  Excessive bedload  Other \_\_\_\_\_

Score: 4

If available: Bank Erosion Hazard Index: \_\_\_\_\_ Near Bank Stress: \_\_\_\_\_  
**Aquatic Life:** (if available; use nearest, most recent Biological Stream Survey point in stream):

Benthic IBI- Value: \_\_\_\_\_ Rating:  Good (> 4)  Fair (3-3.99)  Poor <3 Fish IBI- Value: \_\_\_\_\_ Rating:  Good (> 4)  Fair (3-3.99)  Poor <3

Observations/Comments:

**Hydroperiod and Hydrologic Connectivity** – Determine the natural variability and/or recent alteration of the duration, frequency, and magnitude of inundation/saturation in the AA by KWH type.

**Natural variation of hydroperiod:**  Low  High

Information Sources:  Visual indicators  Monitoring Wells  Hydrology/Hydraulic analysis  Bank Height Ratio \_\_\_\_\_ Entrenchment Ratio \_\_\_\_\_

**Overbank flooding** (if available):  2-year storm  10-year  100-year

**Degree of connection to floodplain:**  Complete **Disconnection/entrenchment:**  Minimal  Moderate  Disconnected and/or severely entrenched

**Evidence of overbank flooding:**  Recent  Evidence of overbank flooding  Some evidence, likely during large storm events  Generally no longer occurs

**Change/Alteration of hydroperiod:**  None  Due to natural events  Due to human influences:  Minor  Moderate  Substantial

Backwater flooding or lateral movement affected by restrictions: List restrictions: \_\_\_\_\_

Score: 4

Observations/Comments:

# Hydrology Module Conclusion

- In this module you learned:
  - How to distinguish between natural and unnatural water sources, with a few examples of each on the data sheet
  - The notable features of streambanks, their channels, how to determine stability, sources of instability, and how a variety of stream features impact the overall stability
  - How to determine hydroperiod and how to use features such as soil redox concentrations or depletions as evidence to support your assessment.

# Key Wildlife Habitat Module

# Key Wildlife Habitat Interspersion/Patch Richness:

## KEY WILDLIFE HABITAT (Section 4.6)

**Interspersion/Patch Richness** –interspersion of vegetation patches **and** number of different obvious types of physical surfaces or features that may provide habitat for aquatic, wetland, or riparian animal species.

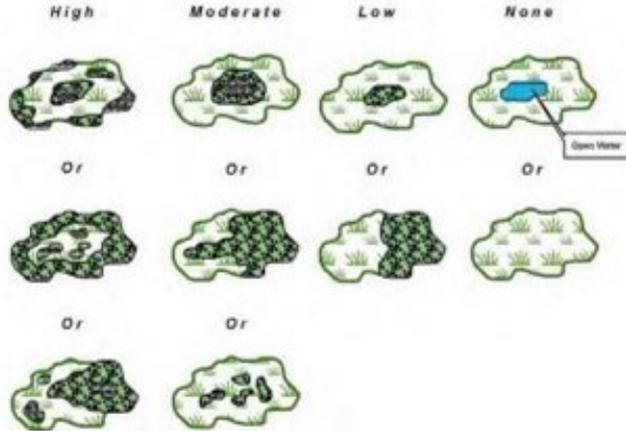
**Interspersion of habitats/physical features** (see examples):  High  Moderate  Low or Minimal  None or Few

**Features present:**  Spring or upwelling groundwater  Depression  Vegetated pool  Unvegetated pool  Unvegetated flat  Island  Animal mound or burrow  Beaver dam or lodge  Beaver-chewed vegetation  Oxbow, swale, secondary channel  Wind-thrown tree hole  Mound  Bank overhang with tree roots  Tip-up tree root mound  Brush piles  Abundant deciduous leaf litter  Partially buried natural debris  Debris jam  Plant hummock/tussocks  Other wildlife habitat

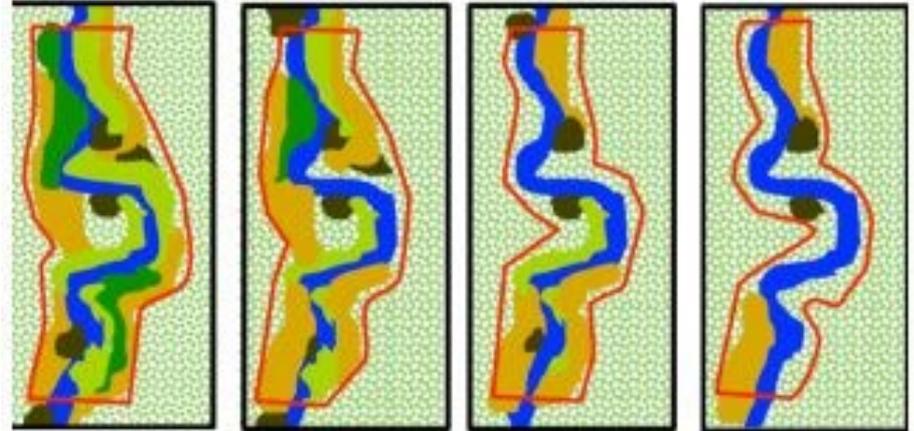
Wildlife species observed: \_\_\_\_\_ **Score:** \_\_\_\_\_

- More features? Better site!

# Interspersion and Patch Richness



**Coastal Plain Seepage Swamp, Coastal Plain Bog and Fen, Coastal Plain Flatwood and Depression Swamp, Vernal Pool, Spring.** (Source: US ACE 2015 Texas Rapid Assessment Method)  
**Scoring: High = 4, Moderate = 3, Low = 2, None = 1**



**Coastal Plain Floodplain:** The red box represents the boundary of the AA and each color represents a unique plant zone. The speckled background represents the background matrix vegetation zone, and the blue represents the stream. (Source: California Rapid Assessment Methods for Wetlands Riverine Wetlands Field Book 2013)  
**Scoring: A = 4, B = 3, C = 2, D = 1**

# Key Wildlife Habitat Vertical Structure:

**Vertical Structure** – Refer to metrics for selected Key Wildlife Habitat Type for scoring.

**Forested systems: Canopy:** Heterogeneous patches of different ages or sizes:  Yes  Mostly  Somewhat  No

Gaps of varying sizes  Impacted by beaver activity  Impacted by forest pests/pathogens

**Woody vertical layers:**  Multiple layers present  One layer missing or homogeneous  >1 layer missing, little variation  Only 1-2 layers present

**Large trees** (DBH > 60 cm or 24") present:   $\geq 10\%$   <10%

**Trees present** with DBH > 30 cm or 12":   $\geq 20\%$   < 20%

**Degradation** due to cutting, browsing, pests/pathogens:  Minimal  Moderate  Extensive Source(s) of degradation: \_\_\_\_\_

**Bog and Fen systems: Woody layer mortality (if layer present):**  Due to natural factors  Minor human-caused  Moderate human-caused

Extensive human-caused  Impacted by forest pests/pathogens  Impacted by browsing/grazing

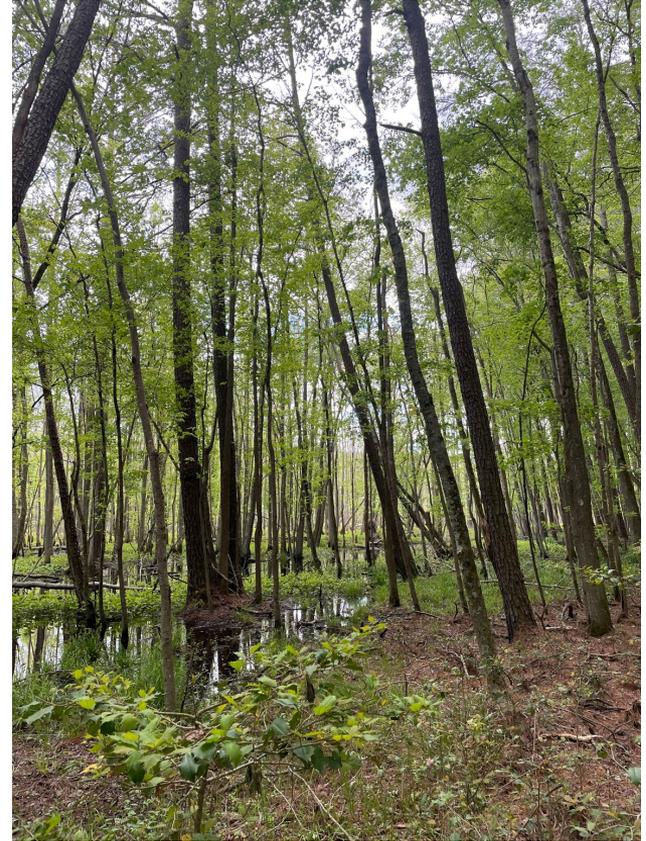
**Expected structure:**  Present  Minor alteration  Moderate Alteration  Extensive Alteration

**Score :** \_\_\_\_\_

- Canopy
- Vertical Layers
- Large Trees
- Degradation

# Key Wildlife Habitat - Coastal Plain Version

## Vertical Structure Images:



# Key Wildlife Habitat

## Standing and Downed Coarse Woody Debris:

***Standing and Downed Coarse Woody Debris*** – Refer to metrics for selected Key Wildlife Habitat type for scoring.

**Forested systems: Standing snags and downed logs: Size diversity:**  High  Moderate  Moderate-low  Low

**Stage of downed log decay:**  Variable including advanced stage  Variable with few advanced  Variable with no advanced  Low variability

Source(s) of woody debris if not natural (cutting, pest/pathogens, etc.): \_\_\_\_\_

**Bog and Fen systems: Woody and/or litter:**  Typical peat accumulation  Human-caused alteration Minor  Moderate  Substantial  Impacted by forest pests/pathogens

**Ground cover alterations:**  None  Minor  Moderate  Substantial

**Score:** \_\_\_\_\_

- Standing snags
- Stage of decay

# Key Wildlife Habitat Scoring:

**Coastal Plain Seepage Swamp, Coastal Plain Bog and Fen, Coastal Plain Flatwood and Depression Swamp, Vernal Pool, Spring.** (Source: US ACE 2015 Texas Rapid Assessment Method)  
**Scoring: High = 4, Moderate = 3, Low = 2, None = 1**

**Coastal Plain Floodplain:** The red box represents the boundary of the AA and each color represents a unique plant zone. The speckled background represents the background matrix vegetation zone, and the blue represents the stream. (Source: California Rapid Assessment Methods for Wetlands Riverine Wetlands Field Book 2013)

**Scoring: A = 4, B = 3, C = 2, D = 1**

**Table 23. Patch Richness Scoring Metric.**

Score	Coastal Plain Floodplain, Coastal Plain Seepage Bog and Fen, Coastal Plain Seepage Swamp	Coastal Plain Flatwood and Depression Swamp	Vernal Pool/Spring
4	≥ 6	≥ 7	≥ 4
3	5-6	6-7	3-4
2	3-4	4-5	2
1	≤ 3	≤ 4	≤ 2

**Table 24. Interspersion and Patch Richness Metric Rating Criteria.**

Score	Mean of Interspersion and Patch Richness Metric Scores
Excellent = 4	3.5 – 4
Good = 3	2.6 - 3.4
Fair = 2	1.6- – 2.5
Poor = 1	1 – 1.5

# Key Wildlife Habitat Scoring Tables: Vertical Structure

## Coastal Plain Floodplain, Coastal Plain Flatwood and Depression Swamp, Coastal Plain Seepage Swamp

**Vernal Pool and Spring:** only assess structure in area surrounding basin- limited to sparse herbaceous vegetation is usually present in the basin area.

Note: Recent beaver activity may lead to deviations from rating descriptions for Coastal Plain Floodplain. This should be noted on the data sheet.

Score	Assign rating to category with majority of features present:	SCORE _____
Excellent = 4	Tree canopy or highest woody level present is a heterogeneous mosaic of patches of different ages or sizes. Gaps of varying size. Multiple layers are created through the presence of trees of varying ages and heights and the shrub layer. Large trees (> 60 cm or 24" dbh) expected to be present ( $\geq$ 10% of trees present). If large trees are absent, few or no large stumps are present and there is evidence of a natural disturbance event (e.g., large downed wood from wind storms, fire scars, beaver activity, tree senescence). Little impact from deer browse.	
Good = 3	Tree canopy or highest woody level present is largely heterogeneous in age or size. Multiple layers are present, but one layer missing or little variation in ages and heights of woody vegetation in at least one layer. Less than 10% of trees present are large trees (>60 cm or 24" dbh) due to human activities. At least 20% of trees present are >30 cm or 12" dbh. Minor presence of cutting, browsing, grazing and other degradation such as forest pest/pathogens. If large trees are absent, few or no large stumps are present and there is evidence of a natural disturbance event (e.g., large downed wood from wind storms, fire scars, beaver activity, tree senescence). Little impact from deer browse.	
Fair = 2	Tree canopy or highest woody level present is somewhat homogeneous in age or size. More than one layer present, but one or more layers missing. Little variation in ages and heights of woody vegetation in layers. Less than 20% of trees present are >30 cm or 12" dbh are present. Moderate levels of cutting, browsing, or grazing, or other degradation such as forest pest/pathogens has caused the loss of larger trees rather than a natural disturbance event.	
Poor = 1	Tree canopy or highest woody level present is very homogeneous in age or size. Only one or two layers present due to human activities. Most, if not all, larger trees (dbh 30-60 cm or 12-24") have been removed. Major cutting, heavy browsing, grazing, or other degradation such as forest pest/pathogens.	

# Key Wildlife Habitat Scoring Tables: Vertical Structure

## Coastal Plain Seepage Bog and Fen

Score	Assign rating to category with majority of features present
Excellent = 4	<p>Mortality of woody vegetation, if present, is due to natural factors such as wind storms or senescence. Excellent potential for site recovery given structure present and lack of degradation (past or present).</p> <p><u>Bogs/acidic fens:</u> Peatland structure includes shrub and herb strata (some tall and some short). When present (peatland not too wet), trees are relatively short and stunted with rounded tops and furrowed bark. Shrubs are &lt; 50 cm and open enough to allow for a nearly continuous ground cover of <i>Sphagnum</i> and other expected vegetation around tree/shrub bases AND in low hummocks, hollows, or other low areas.</p> <p><u>Circumneutral/rich fens:</u> Primarily short-statured vegetation and nearly continuous cover of mosses (except in tall sedge fens - which are naturally more vigorous, homogenous, and often with little bryophyte cover). Shrubs may be present as a mosaic with open areas. Tree species, when present, do not form a closed canopy. <i>Sphagnum</i> and other mosses actively growing. Never more than local, small patches of degenerating <i>Sphagnum</i>.</p>
Good = 3	<p>Minor negative anthropogenic influences present, or the site is still recovering from major past human disturbances. Mortality or degradation due to grazing, peat mining, limited timber harvesting, or other anthropogenic factors may be present, though not widespread. The site can be expected to meet minimally disturbed conditions in the near future if negative influences do not continue.</p> <p><u>Bogs/acidic fens:</u> Shrubs and herbs show minor alterations from expected conditions. A few areas of dense and tall shrubs (&gt; 1 m) may occur (dense enough to eliminate <i>Sphagnum</i>/moss growth). Some trees may have been or killed due to anthropogenic stressors.</p> <p><u>Circumneutral/rich fens:</u> Shrubs and herbs show minor alterations from expected conditions.</p>
Fair = 2	<p>Expected structural classes are not present. Shrubs and herbs moderately altered from expected conditions. The site will recover to minimally disturbed conditions only with the removal of degrading influences and moderate recovery times.</p> <p><u>Bogs/acidic fens:</u> Shrub cover averages &gt; 1 m tall and is beginning to reduce <i>Sphagnum</i> cover. Many trees have been cut or killed due to anthropogenic stressors.</p> <p><u>Circumneutral/rich fens:</u> Trampling or other physical disturbance has moderately reduced moss cover where expected. Overall, evidence of degradation includes moderate levels of cutting, mowing, browsing, fire or grazing. <i>Sphagnum</i> still regenerating in open areas.</p>
Poor = 1	<p>Expected peatland structure is absent or much degraded due to anthropogenic factors, such as <u>peat mining, Overall, evidence of degradation includes major cutting, mowing, browsing, fire or grazing</u>. Woody regeneration is minimal and existing structure is in poor condition, unnaturally sparse, or depauperate. Shrubs and herbs substantially altered from expected conditions. Recovery to minimally disturbed condition is questionable without restoration, or will take many decades.</p> <p><u>Bogs/acidic fens:</u> Most if not all <i>Sphagnum</i> cover has been eliminated due to extremely dense and tall (&gt; 1 m) shrubs. Trees have all been cut or killed by anthropogenic stressors.</p> <p><u>Circumneutral/rich fens:</u> Trampling or other physical disturbance has eliminated moss cover where it is expected. <i>Sphagnum</i> not regenerating, even in open areas.</p>

# Key Wildlife Habitat Scoring Tables: Vertical Structure

<b>Spring</b>	
<b>Score</b>	<b>Assign rating to category with majority of features present</b>
Excellent = 4	Expected levels of abundance and diversity (some tall and some short) and/or low cover of shrubs or trees where appropriate. Overall, no evidence and little to no structural indicators of degradation evident.
Good = 3	For the most part, expected levels of abundance and diversity (some tall and some short) and/or low cover of shrubs or trees where appropriate. Minor structural degradation (cutting, mowing, browsing, grazing).
Fair = 2	Structural indicators of degradation are moderate. Overall, evidence of degradation includes moderate levels of cutting, mowing, browsing or grazing.
Poor = 1	Vegetation structure is greatly altered from minimally disturbed natural conditions. Structural indicators of degradation are strong. Overall, evidence of human and degradation includes major cutting, mowing, browsing or grazing.

# Key Wildlife Habitat Scoring Tables: Woody Debris Criteria

**Table 26. Standing and Downed Woody Debris Metric Rating Criteria.**

Coastal Plain Floodplain, Coastal Plain Flatwood and Depression Swamp, Coastal Plain Seepage Swamp	
<p><b>Vernal Pool and Spring:</b> assess presence in immediate surrounding area as well as basin, which may only have scattered coarse woody debris, if any.</p> <p>If non-natural sources have created standing and/or downed woody debris, such as cutting or forest pests/pathogens, indicate this on the data sheet.</p>	
Score	Assign rating to category with majority of features present
Excellent = 4	Wide diversity of sizes for both standing and downed logs, including larger sizes [ $> 30$ cm (12 in) DBH and $> 2$ m (6 ft) long]] present with 5 or more snags per ha (2.5 ac), but not excessive numbers (suggesting disease or other problems). Downed logs are in various stages of decay, from sound and intact to soft pieces that no longer maintain their shape.
Good = 3	Moderate diversity of sizes for both standing and downed logs, but larger sizes [ $> 30$ cm (12 in) DBH and $> 2$ m (6 ft) long]] are rare. Larger size class present with 2-4 snags per ha, or an increased but not excessive number of snags (suggesting disease or other problems). Downed logs are in various stages of decay, with few soft pieces that no longer maintain their shape.
Fair = 2	Moderate-low diversity of sizes for both standing and downed logs, but larger sizes [ $> 30$ cm (12 in) DBH and $> 2$ m (6 ft) long]] very rare or not present. Larger size class present with 1-2 snags per ha, or moderately excessive numbers (suggesting disease or other problems). Downed logs are in various stages of decay, but few to no soft pieces that no longer maintain their shape.
Poor = 1	Low diversity of sizes for both standing and downed logs. Larger size class [ $> 30$ cm (12 in) DBH and $> 2$ m (6 ft) long]] present with $< 1$ snag per ha, or very excessive numbers (suggesting disease or other problems). Downed logs are mostly in early stages of decay.

# Key Wildlife Habitat Scoring Tables: Woody Debris Criteria

Coastal Plain Seepage Bog and Fen	
Score	Assign rating to category with majority of features present
Excellent = 4	<p>Typical of the system. Woody vegetation mortality is due to natural factors. Peat accumulation appears to be stable or actively growing.</p> <p>Bogs/acidic fens: <i>Sphagnum</i> is nearly continuous and growing around tree/shrub bases AND in low hummocks, hollows, or other low areas.</p> <p>Circumneutral/rich fens: Dominant species are active peat-formers.</p>
Good = 3	<p>Minor alterations to system present.</p> <p>Bogs/acidic fens: Mortality or degradation of peat surface due to grazing, limited timber harvesting, anthropogenic fire or other anthropogenic factors may be present, but not widespread.</p> <p>Circumneutral/rich fens: Mortality or degradation of peat surface due to grazing, limited timber harvesting, anthropogenic fire or other anthropogenic factors may be present, but not widespread.</p>
Fair = 2	<p>Moderate alterations to system present.</p> <p>Bogs/acidic fens: Ground cover has as much bare peat as <i>Sphagnum</i> cover, or nearly so.</p> <p>Circumneutral/rich fens: Dominance of active peat-formers is being reduced in favor of non-peat-forming grasses and forbs.</p>
Poor = 1	<p>Substantial alterations to system present.</p> <p>Bogs/acidic fens: Ground cover is almost all bare peat with very little <i>Sphagnum</i> cover.</p> <p>Circumneutral/rich fens: Cover of active peat-formers dramatically reduced and site is now dominated by non-peat-forming grasses and forbs.</p>

# Key Wildlife Habitat Example:



- Interspersion, Vertical Structure, and Standing and Downed Coarse Woody Debris
  - Notice the groups of varying plant communities, the size of the trees, and signs of herbivory

# Key Wildlife Habitat Example Cont:

## KEY WILDLIFE HABITAT (Section 4.6)

**Interspersion/Patch Richness** – interspersion of vegetation patches and number of different obvious types of physical surfaces or features that may provide habitat for aquatic, wetland, or riparian animal species.

**Interspersion of habitats/physical features** (see examples):  High  Moderate  Low or Minimal  None or Few

**Features present:**  Spring or upwelling groundwater  Depression  Vegetated pool  Unvegetated pool  Unvegetated flat  Island  Animal mound or burrow  Beaver dam or lodge  Beaver-chewed vegetation  Oxbow, swale, secondary channel  Wind-thrown tree hole  Mound  Bank overhang with tree roots  Tip-up tree root mound  Brush piles  Abundant deciduous leaf litter  Partially buried natural debris  Debris jam  Plant hummock/tussocks  
 Other wildlife habitat      Wildlife species observed: \_\_\_\_\_

Score: 4

**Vertical Structure** – Refer to metrics for selected Key Wildlife Habitat Type for scoring.

**Forested systems: Canopy:** Heterogeneous patches of different ages or sizes:  Yes  Mostly  Somewhat  No

Gaps of varying sizes  Impacted by beaver activity  Impacted by forest pests/pathogens

**Woody vertical layers:**  Multiple layers present  One layer missing or homogeneous  >1 layer missing, little variation  Only 1-2 layers present

**Large trees** (DBH > 60 cm or 24") present:  ≥10%  <10%

**Trees present** with DBH > 30 cm or 12":  ≥ 20%  < 20%

**Degradation** due to cutting, browsing, pests/pathogens:  Minimal  Moderate  Extensive      Source(s) of degradation: \_\_\_\_\_

**Bog and Fen systems: Woody layer mortality (if layer present):**  Due to natural factors  Minor human-caused  Moderate human-caused

Extensive human-caused  Impacted by forest pests/pathogens  Impacted by browsing/grazing

**Expected structure:**  Present  Minor alteration  Moderate Alteration  Extensive Alteration

Score: 2

**Standing and Downed Coarse Woody Debris** – Refer to metrics for selected Key Wildlife Habitat type for scoring.

**Forested systems: Standing snags and downed logs: Size diversity:**  High  Moderate  Moderate-low  Low

**Stage of downed log decay:**  Variable including advanced stage  Variable with few advanced  Variable with no advanced  Low variability

Source(s) of woody debris if not natural (cutting, pest/pathogens, etc.): \_\_\_\_\_

**Bog and Fen systems: Woody and/or litter:**  Typical peat accumulation  Human-caused alteration Minor  Moderate  Substantial  Impacted by forest pests/pathogens

**Ground cover alterations:**  None  Minor  Moderate  Substantial

Score: 2

# Key Wildlife Habitat Module Conclusion

- In this module you learned:
  - How interspersion appears in a variety of of KWH and how to use Fig. 5 from the manual to determine the level of interspersion.
  - What physical features contribute to the score for interspersion/patch richness.
  - How to score out woody layers, both living and nonliving.

# Key Wildlife Habitat Vegetation Composition Module

# Key Wildlife Habitat Vegetation Composition

## Invasive Species:

**KWH VEGETATION COMPOSITION** (Use tables in Section 4.6 to assign scores).

*Invasive Species:*

Maximum invasive species cover in any one woody layer (if present):  <1%  1-5%  >5-10%  >10%

Absolute cover of invasive/disturbance species in herbaceous layer:  <1%  1-5%  >5-30%  >30%

Score: \_\_\_\_\_

# Key Wildlife Habitat Vegetation Composition Native Species:

**Native Species:** Refer to metrics for selected Key Wildlife Habitat Type for scoring.

**Woody layer (if present):**  Dominated by diagnostic native species  Some diagnostic species absent/reduced  Few diagnostic species  Few/no diagnostic species present

**Herbaceous layer:**  Dominated by diagnostic native species  Some diagnostic species absent/reduced  Few diagnostic species  Few/no diagnostic species present

**Cover of native species indicative of disturbance:**  0-1%  2-10%  >10-30%  >30%

**Bog and Fen/Springs: Sphagnum cover -**  Continuous/abundant  Absent from small areas  Reduced  Very low

**Score:** \_\_\_\_\_

# Key Wildlife Habitat Vegetation Composition Native Species Table:

Key Wildlife Habitat	Trees	Shrubs	Herbs	Vines	Indicator**	Exotic Spp.***
<b>Coastal Plain Floodplain</b>	<i>Platanus occidentalis, Liquidambar styraciflua, Liriodendron tulipifera, Quercus michauxii, Fraxinus pennsylvanica, Betula nigra</i>	<i>Lindera benzoin, Asimina triloba, Ilex opaca, Ilex verticillata, Carpinus caroliniana</i>	<i>Thelypteris noveboracensis, Mitchellia repens, Arisaema triphyllum, Boehmeria cylindrica, Saururus cernuus, Cinna arundinacea, Galium circaezans, Medeola virginiana, Thalictrum thalictroides, Impatiens capensis, Glyceria striata</i>	<i>Toxicodendron radicans, Parthenocissus quinquefolia, Campsis radicans</i>	<i>Platanus occidentalis, Betula nigra, Thelyperis noveboracensis, Saururus cernuus, Cinna arundinacea</i>	<i>Microstegium vimineum, Glechoma hederacea, Rosa multiflora, Ligustrum sinense, and Lonicera japonica</i>
<b>Coastal Plain Flatwood and Depression Swamp</b>	<i>Quercus phellos, Quercus palustris, Quercus michauxii, Quercus pagoda, Liquidambar styraciflua</i>	<i>Eubotrys racemosa, Vaccinium corymbosum, Clethra alnifolia,</i>	<i>Woodwardia areolata, Osmunda cinnamomea, Mitchellia repens, Osmunda regalis, Chasmanthium laxum</i>	<i>Smilax rotundifolia</i>	<i>Quercus pagoda, Quercus michauxii</i>	<i>Lonicera japonica, Phalaris arundinacea, Phragmites australis</i>
<b>Vernal Pool</b>	Varies	Varies	Varies	Varies		Varies
<b>Spring</b>	Varies	Varies	Varies	Varies		Varies
<b>Coastal Plain Seepage Bog and Fen</b>	<i>Nyssa sylvatica, Acer rubrum, Pinus rigida</i>	<i>Rhododendron viscosum, Toxicodendron vernix, Rubus hispidus, Ilex glabra, Clethra alnifolia</i>	<i>Carex atlantica, Andropogon glomeratus, Rhynchospora gracilentia, Eupatorium pilosum, Dichanthelium dichotomum var. dichotomum</i>	<i>Smilax pseudochina</i>	<i>Smilax pseudochina, Pinus rigida, Andropogon glomeratus, Rhynchospora gracilentia</i>	<i>Phragmites australis, Microstegium vimineum</i>
<b>Coastal Plain Seepage Swamp</b>	<i>Nyssa sylvatica, Acer rubrum, Magnolia virginiana</i>	<i>Clethra alnifolia, Viburnum nudum, Rhododendron viscosum</i>	<i>Woodwardia areolata, Osmunda cinnamomea, Osmunda regalis, Carex folliculata</i>	<i>Smilax rotundifolia</i>	<i>Magnolia virginica, Clethra alnifolia, Viburnum nudum</i>	<i>Microstegium vimineum</i>

# Key Wildlife Habitat Vegetation Composition Alterations/Stressors:

**Alterations/Stressors:** *Indicate stressors and alterations affecting the observed vegetation composition of the AA.*

- Recent timber harvest (clearcut or selective cut)  Tree plantation  Mowing or shrub cutting  Herbicide use  Trampling/ORV  Excessive animal herbivory  Pest damage  Unnatural fire regime  Trash/dumping  
 Other \_\_\_\_\_

**Suggestions for improving native species cover and natural vegetation composition** \_\_\_\_\_

---

# Key Wildlife Habitat Vegetation Composition Floristic Quality Assessment:

**Floristic Quality Assessment:** (see Excel data sheet or manual for calculation):

Native mean C-value \_\_\_\_\_ :  >4  3-4  <3-2  <2

Adjusted FQI \_\_\_\_\_

Score: \_\_\_\_\_

- Use the Excel sheet to calculate the FQA value
  - If there is an issue, got to <https://universalfqg.org/> as an alternative

# Key Wildlife Habitat Vegetation Tables: Invasive Species

**Table 27. Invasive Species Metric Rating Criteria.**

<b>Coastal Plain Floodplain, Coastal Plain Flatwood and Depression Swamp, Coastal Plain Seepage Swamp, Coastal Plain Bog and Fen</b>	
<b>Vernal Pool and Spring:</b> assess vegetation structure in area surrounding basin, as only limited to sparse vegetation may be present in the basin area.	
<b>Score</b>	<b>Assign rating to category with majority of features present</b>
Excellent = 4	Invasive species are absent from all layers or absolute cover in any one woody layer (if present) and herbaceous layer is <1%.
Good = 3	Invasive species are sporadic (no more than 5% absolute cover in any layer).
Fair = 2	Absolute cover of Invasive species is 5-10% in any one woody layer (if present) and/or present with moderate absolute cover (5-30%) in the herbaceous layer. Patches of native vegetation are reduced in size and complexity due to the presence of invasive species.
Poor = 1	Absolute cover of Invasive species is over 10% in any one woody layer (if present) and/or is very abundant (over 30%) in the herbaceous layer. vegetation reduced in size and complexity due to human disturbance. Patches of native vegetation are reduced in size and complexity due to the presence of invasive species.

# Key Wildlife Habitat Vegetation Tables: Native Species

**Table 28. Native Species Metric Rating Criteria.**

Coastal Plain Floodplain, Coastal Plain Flatwood and Depression Swamp, Coastal Plain Seepage Swamp, Coastal Plain Bog and Fen	
<p><b>Vernal Pool and Spring:</b> assess vegetation structure in area surrounding basin, as only limited to sparse vegetation is usually present in the basin area.</p> <p><b>Note:</b> Recent beaver activity may lead to deviations from rating descriptions for Coastal Plain Floodplain. This should be noted on the data sheet and taken into account.</p>	
Score	Assign rating to category with majority of features present
Excellent = 4	<p>Herbaceous and woody layers (if present) dominated by indicator native species. Layers may be sparse and patchy in areas with deeper flooding, with patches of vegetation confined to hummocks. In other areas, diverse native vegetation present unless there has been a recent natural disturbance.</p> <p>Bog and Fen, some Springs: <i>Sphagnum</i> is nearly continuous and growing around tree/shrub bases AND in low hummocks, hollows, or other low areas.</p>
Good = 3	<p>Some indicator native species absent or substantially reduced in abundance OR low cover (&lt;10%) of native species indicative of human disturbance. Layer may be sparse and patchy in areas with deeper flooding.</p> <p>Bog and Fen, some Springs: <i>Sphagnum</i> and other mosses actively growing, but may be eliminated from some areas due to disturbance or invasive species.</p>
Fair = 2	<p>Few indicator species are present. Native species indicative of human disturbance are present with moderate cover (10-30%). Patches of native vegetation are reduced in size and complexity due to human disturbance.</p> <p>Bog and Fen, some Springs: <i>Sphagnum</i> cover reduced but still regenerating in open areas. Dominance of active peat-formers is being reduced in favor of non-peat-forming grasses and forbs.</p>
Poor = 1	<p>Few to no indicator species are present. Native species indicative of human disturbance are present with &gt;30% cover. Patches of native vegetation are reduced in size and complexity due to human disturbance.</p> <p>Bog and Fen, some Springs; Very little <i>Sphagnum</i> cover. Cover of active peat-formers dramatically reduced and site is now dominated by non-peat-forming grasses and forbs.</p>

# Key Wildlife Habitat Vegetation Composition Example:

- Fill out the dominant plants in the Excel Data Sheet
  - In this case, the KWH is a Coastal Plain Seepage Swamp.
  - The values for the Floristic Quality Assessment should auto-populate
- Consult Table 13. In the manual to determine the diagnostic native species.

Species:	% Cover:	If Native
<b>Tree Stratum: woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height</b>		
1 <i>Magnolia virginiana</i>	20	6
2 <i>Nyssa sylvatica</i>	15	6
3 <i>Acer rubrum</i>	10	1
4 <i>Quercus bicolor</i>	5	8
5		
6		
<b>Sapling Stratum: woody plants, excluding woody vines, approx.. 20 ft (6 m) or more in height</b>		
1 <i>Nyssa sylvatica</i>	8	6
2 <i>Acer rubrum</i>	6	1
3 <i>Magnolia virginiana</i>	2	6
4		
5		
6		
<b>Shrub Stratum: woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m)</b>		
1 <i>Clethra alnifolia</i>	15	4
2 <i>Carpinus caroliniana</i>	10	6
3 <i>Lindera benzoin</i>	5	5
4 <i>Ilex opaca</i>	4	4
5 <i>Rosa multiflora</i>	2	non-native
6		
<b>Herb Stratum: all herbaceous (non-woody) plants, including herbaceous vines, regardless of height</b>		
1 <i>Osmundastrum cinnamomeum</i>	10	6
2 <i>Carex folliculata</i>	5	7
3 <i>Woodwardia areolata</i>	3	5
4 <i>Microstegium vimineum</i>	5	non-native
5 <i>Ilex opaca</i>	1	4
6		
7		
8		
9		
10		
11		
<b>Woody Vine Stratum: all woody vines, regardless of height</b>		
1 <i>Toxicodendron radicans</i>	3	1
2 <i>Parthenocissus quinquefolia</i>	2	3
3 <i>Smilax rotundifolia</i>	2	2
4		
5		

# Key Wildlife Habitat Vegetation Composition Example:

## KWH VEGETATION COMPOSITION (Use tables in Section 4.6 to assign scores).

### *Invasive Species:*

Maximum invasive species cover in any one woody layer (if present):  <1%  1-5%  >5-10%  >10%

Absolute cover of invasive/disturbance species in herbaceous layer:  <1%  1-5%  >5-30%  >30%

Score: 3

### *Native Species: Refer to metrics for selected Key Wildlife Habitat Type for scoring.*

Woody layer (if present):  Dominated by diagnostic native species  Some diagnostic species absent/reduced  Few diagnostic species  Few/no diagnostic species present

Herbaceous layer:  Dominated by diagnostic native species  Some diagnostic species absent/reduced  Few diagnostic species  Few/no diagnostic species present

Cover of native species indicative of disturbance:  0-1%  2-10%  >10-30%  >30%

Bog and Fen/Springs: Sphagnum cover -  Continuous/abundant  Absent from small areas  Reduced  Very low

Score: 4

### *Alterations/Stressors: Indicate stressors and alterations affecting the observed vegetation composition of the AA.*

Recent timber harvest (clearcut or selective cut)  Tree plantation  Mowing or shrub cutting  Herbicide use  Trampling/ORV  Excessive animal herbivory  Pest damage  Unnatural fire regime  Trash/dumping  
 Other \_\_\_\_\_

Suggestions for improving native species cover and natural vegetation composition \_\_\_\_\_

**Removal of invasive species**

### *Floristic Quality Assessment: (see Excel data sheet or manual for calculation):*

Native mean C-value **4.4** :  >4  3-4  <3-2  <2

Adjusted FQI **40.9**

Score: 4

# Key Wildlife Habitat Vegetation Composition Module Conclusion

- In this module you learned:
  - How to fill out the vegetation section of the data sheet and what plants to note.
  - The impact of invasive species on the score for the appropriate section.
  - What the indicator species are for the KWH's in the Coastal Plain region and their impact on the overall score.
  - What to do in the event that the FQA score is not automatically filled out on the Excel sheet.

# Final Scores

- The information should auto-populate in the Excel.
- It should look something like this, however the extra points must be entered manually.

Scoring Scale: 3.5- 4 = Excellent 2.5-3.49 = Good 1.5-2.49 = Fair 1-1.49 = Poor

Core Factor	Metric	Metric Score	Mean Core Factor Score	Weighting Factor	Overall Core Factor Score (Mean Core Factor Score X Weighting Factor)
Landscape (Assessment for project area)	Buffer Perimeter	4	(Sum of metric scores: _____) / 4 = <u>3.25</u>	0.3	0.975
	Buffer Condition	4			
	Aquatic Context	4			
	Comparative Size	1			
Soil/Substrate* <small>* If only Microtopography, Organic Matter Accumulation, and Soil Disturbance were scored, divide by 3 rather than 5</small>	Redox Concentrations	1	(Sum of metric scores: _____) / 5 or /3* = _____  2.800	0.1	0.280
	Microtopography	4			
	Soil Organic Matter	1			
	Organic Matter Accumulation	4			
	Soil Disturbance	4			
Hydrology	Water source	4	(Sum of metric scores: _____) / 3 = <u>4.00</u>	0.2	0.800
	Channel	4			
	Hydroperiod and Hydrologic Connectivity	4			
Key Wildlife Habitat and Vegetation Composition	Interspersion/Patch Richness	4	(Sum of metric scores: _____) / 6 = <u>3.167</u>	0.4	1.267
	Vertical Structure	2			
	Coarse Woody Debris	3			
	Invasive Species	2			
	Native Species Composition	4			
	Floristic Quality Assessment	4			
<b>Sum of Overall Core Factor Scores = Overall KWH Ecological Integrity Assessment (EIA) Score:</b>					<b>3.322</b>
<b>Add additional Points IF the Overall EIA score is not "Excellent" for each of the following:</b> From WRR layers (see Manual Section 3.1): <input type="checkbox"/> Nontidal Wetlands of Special State Concern (+ 0.2) <input checked="" type="checkbox"/> Biodiversity Conservation Network Tier 1, 2, or 3 (+ 0.2) <input checked="" type="checkbox"/> Forest Interior Dwelling Species (FIDS) area: Class 1 (+ 0.1) <input type="checkbox"/> Targeted Ecological Area (+ 0.1) From MDE Tier II High Quality Waters (Section 3.1): <input type="checkbox"/> Upstream of, within, or adjacent to Tier II High Quality stream segment (+ 0.2) From StreamStats (see Manual Section 3.1): <input checked="" type="checkbox"/> Impervious surface area for project area basin is low (< 5%) (+ 0.2) <input type="checkbox"/> Forest cover in project area basin is >90% (+ 0.2) From field observations (see Manual Section 5.1): <input type="checkbox"/> Maryland nontidal wetland(s) with significant plant or wildlife value (as defined by COMAR 26.23.01.01B80) but not designated as a Nontidal Wetland of Special State Concern (add + 0.2 for each wetland to the Overall EIA score) <input type="checkbox"/> State rare, threatened, or endangered plants or state rare natural community noted during field data collection but not mapped in Biodiversity Conservation Network Tier 1, 2, or 3 (+ 0.2) <input type="checkbox"/> Dominated by native trees greater than 60cm or 24" diameter at breast height (+ 0.1) <input type="checkbox"/> Dominated by hard mast (i.e., acorns and nuts) producing native species in the tree stratum (+ 0.1)					<b>+0.6</b>
<b>FINAL Key Wildlife Habitat Ecological Integrity Assessment SCORE:</b>					<b>3.922</b>

# Final Remarks

- In these modules we learned:
  - How to properly fill out the data sheet.
  - How various metrics contribute to the overall site score, and what to do in the event that the final score does not exceed 3.5.
  - Guidance on what to do in the event that there is uncertainty regarding scoring and to go with your best professional judgment.
  - A few recommendations to help determine site elements effectively.