

# Rapid Ecological Integrity Assessments of Wetlands of Riparian Areas in Maryland: Piedmont Training Module

**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 _____
<p><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.</p>		

- Record notable features of the site, as well as details regarding the surrounding area
- If it seems irrelevant, write it anyway- it may help later

# 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:</i> %Natural: <input type="checkbox"/> >95% <input type="checkbox"/> 85-95% <input type="checkbox"/> 75-84% <input type="checkbox"/> <75%	
<i>Buffer Condition:</i> %Natural: <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: _____ %limestone geology: _____	
Additional channels in project area visible on LiDAR. Hillshade image:	

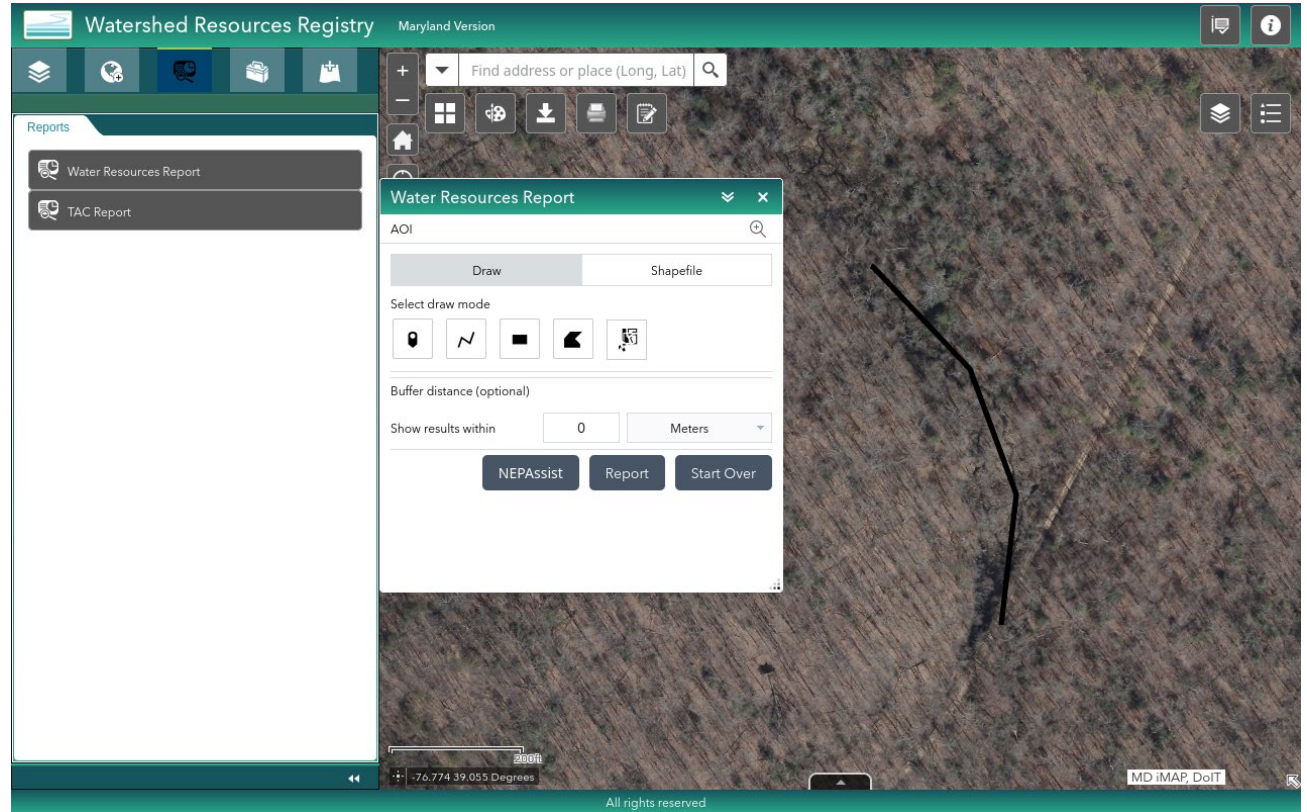
- This portion of the assessment can be done after the field visit in the office
  - Aquatic context can include unmapped water sources such as small seeps and tributaries



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

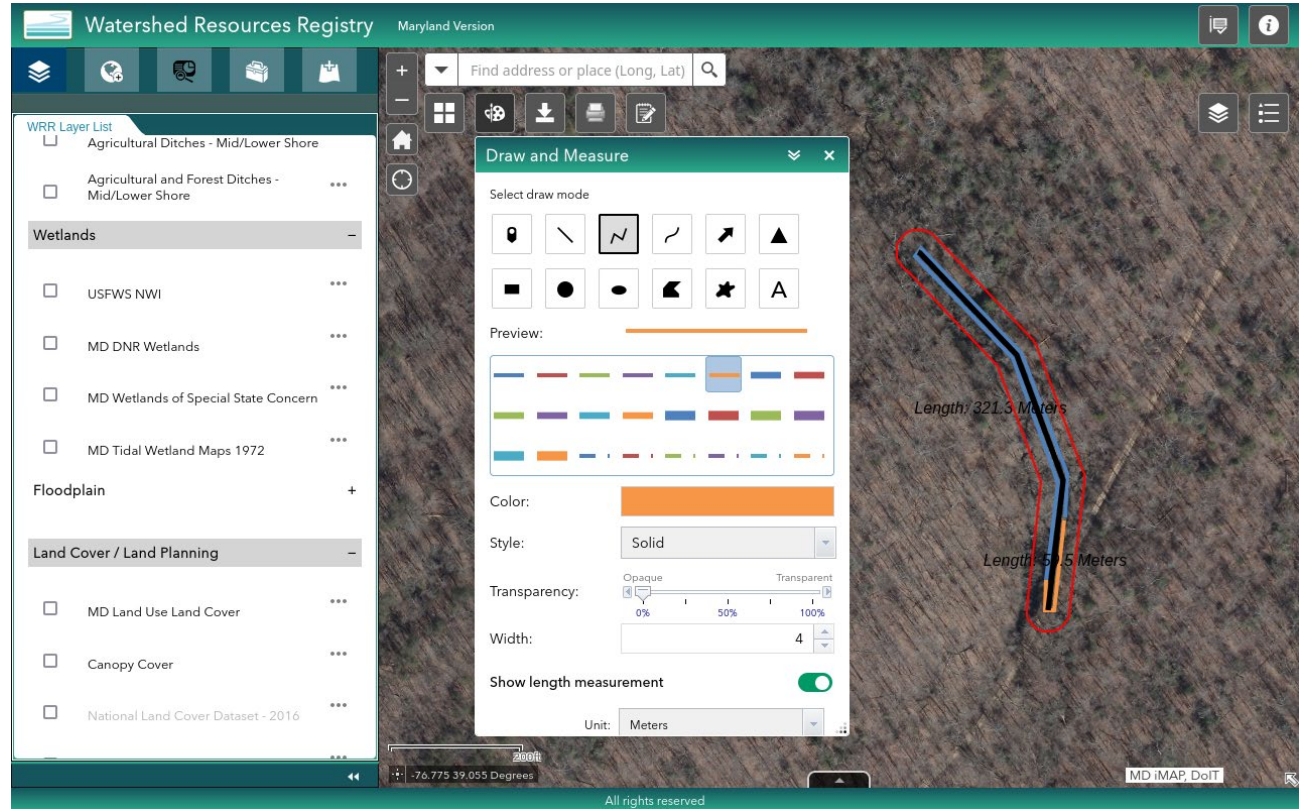
Found at:

<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 3. Guidelines for Identifying Natural Buffers.**

Examples of Land Covers Included in Natural Buffers	Examples of Land Covers Excluded from Natural Buffers
Natural plant communities; naturally vegetated rights-of-way; natural swales and ditches; open water including streams; wetlands	Parking lots; commercial and private developments; roads (all types); intensive agriculture; intensive plantations; orchards; vineyards; railroads; planted pastures; planted hayfields; animal pastures; lawns; sports fields; traditional golf courses; fallow farm fields; ditches; stormwater ponds; ponds formed by unnatural blockages; culverts

**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) Maryland Version web application. The interface includes a search bar at the top with the text "Find address or place (Long, Lat)". On the left, there is a "WRR Layer List" panel with a "Land Cover / Land Planning" section. The "MD Land Use Land Cover" layer is checked. Other layers include "Canopy Cover", "National Land Cover Dataset - 2016", "MD Archived Land Use Land Cover", "Chesapeake Conservancy Landcover", "Generalized Sewer", "Generalized Zoning", and "Priority Funding Areas". Below this are sections for "Geology and Soils" and "LiDAR and Topos".

In the center, a "Water Resources Report" dialog box is open, showing "AOI" (Area of Interest) and "Draw" options. The "Draw" section includes "Select draw mode" with icons for point, line, and polygon, and a "Buffer distance (optional)" field. The "Show results" section is empty.

On the right, a "Legend" dialog box is open, showing a list of land cover categories and their corresponding colors. The legend includes "MD Land Use Land Cover", "County Land Use Land Cover 2010", and "Land Use Land Cover 2010". The "Land Use Land Cover 2010" section lists 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 map shows a green area representing land cover, with a blue area representing water. A red circle highlights a specific area on the map, and a black line is drawn within it. The interface includes a search bar, a layer list, and a legend.

At the bottom of the interface, there is a status bar with the text "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) web application interface. The main map shows an aerial view of a landscape with a stream highlighted in bright green. A red circular buffer is drawn around a section of the stream. A 'Water Resources Report' dialog box is open, showing the 'Draw' tab selected. The 'AOI' (Area of Interest) is defined by the red buffer. The 'Buffer distance (optional)' is set to 300 Meters. The 'Show results within' field is also set to 300 Meters. The 'NEPAAssist', 'Report', and 'Start Over' buttons are visible at the bottom of the dialog. On the left, the 'WRR Layer List' is visible, with 'Rivers and Streams NHD Large Scale' checked under the 'Water' category and 'MD DNR Wetlands' checked under the 'Wetlands' category. A pop-up window on the right identifies a 'Wetlands - Polygon - Department of Natural Resources: Palustrine' with the class 'PFO1C'. The application title is 'Watershed Resources Registry Maryland Version'. The footer includes the text 'MD iMAP, DNR | MD iMAP, DoIT | U.S. Geological Survey' and '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.



**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.

<b>Comparative size incorporating evidence of size reduction due to human activities</b>	
Score	Assign rating to category with majority of features present
Excellent = 4	Very large size compared to other examples of the same type, based on current and historical spatial patterns. Occurrence is at, or only minimally reduced (< 5%) from its original, natural extent due to conversion or disturbance.
Good = 3	Large size compared to other examples of the same type, based on current and historical spatial patterns. Some indicator species are not present. Occurrence is only somewhat reduced (5-10%) from its original natural extent due to conversion or disturbance.
Fair = 2	Medium to small size compared to other examples of the same type, based on current and historical spatial patterns. Several to many indicator species are not present. Occurrence is modestly reduced (10-30%) from its original natural extent due to conversion or disturbance.
Poor = 1	Small size to very small compared to other examples of the same type, based on current and historical spatial patterns. Most or all indicator species are not present. Occurrence is substantially reduced (> 30%) from its original natural extent due to conversion or disturbance.

# StreamStats

USGS StreamStats

Batch Processor Report About Help

Exploration Tools

Layers

- Base Maps
- Application Layers
- National Layers
- MD Map Layers

Parameter List:

- BSLDEM10ff Mean basin slope computed from 10 m DEM in feet per foot
- DRNAREA Area that drains to a point on a stream
- FOREST Percentage of area covered by forest
- FOREST\_MD Percent forest from Maryland 2010 land-use data
- IMPERV Percentage of impervious area
- LC11DEV Percentage of developed (urban) land from NLCD 2011 classes 21-24
- LC11IMP Average percentage of impervious area determined from NLCD 2011 impervious dataset
- LIME Percentage of area of limestone geology
- PRECIP Mean Annual Precipitation
- SOILCorD Percentage of area of Hydrologic Soil

Map Info: Zoom Level: 15, Map Scale: 1:18,055, Lat: 39.0390, Lon: -76.7930

Scale: 330 m, 1000 ft

Leaflet | Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Basin Characteristics can be edited here

Calculate Missing Parameters

Parameter	Value
FOREST	73.8
IMPERV	7.88
LIME	0

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:

METRIC	SCORE (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> %limestone geology: <u>0</u> Additional channels in project area visible on LiDAR Hillshade image:	

- 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:

**Table 9. Landscape Position.** (Check all features present on the data sheet).

Active floodplain (depression or terrace)	Beaver pond/Natural impoundment	Riparian-Depression (in floodplain)	Riparian terrace (outside seasonal flooding; historic floodplain or current terrace)
Headwater stream/spring	Seep/groundwater discharge site- toe slope	Swale	Isolated Depression
Oxbow	Wetland charged by groundwater seeps- hill slope	Streambank	Point bar
Flats	Braided Channels	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:

**Table 10. Water Source.** (If more than one source is present, indicate which is primary, secondary, and tertiary on the data sheet).

Direct precipitation	Groundwater discharge	Natural surface flow	Urban run-off/culverts
Overbank flooding	High groundwater	Irrigation	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:



Photo: Frank Plewa, USACE

# Environmental Information

## Wetland Assessment Area Only Example Cont:

**Landscape Position:** Indicate all features present.

<input checked="" 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"/> Seep/groundwater discharge site (toe slope)	<input type="checkbox"/> Swale	<input type="checkbox"/> Isolated Depression
<input type="checkbox"/> Oxbow	<input type="checkbox"/> Wetland charged by groundwater seeps (hill slope)	<input type="checkbox"/> Streambank	<input type="checkbox"/> Point bar
<input type="checkbox"/> Flats	<input type="checkbox"/> Braided Channels	<input type="checkbox"/> Other- describe	

**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 <b>S</b>	<input type="checkbox"/> Natural surface flow	<input type="checkbox"/> Urban run-off/culverts
<input checked="" type="checkbox"/> <b>P</b> Overbank flooding	<input type="checkbox"/> High groundwater	<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 (see Manual for definitions)

H Permanently Flooded	G Intermittently Exposed	F Semipermanently Flooded	C Seasonally Flooded	<b>E Seasonally Flooded-Saturated</b>
B Seasonally Saturated	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:  Piedmont Stream  Coldwater Stream  Limestone Stream  Piedmont River

- Use key from page 27 in the manual (Table 12) to determine Key Wildlife Habitat (KWH), and each KWH will generally line up with a specific HGM class
- If available, include NVC Community Type/Plant Association

# Table 12: Piedmont

**Table 12: Maryland Key Wildlife Habitat Classification Key for non-tidal wetland habitats of the Piedmont, 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). Structurally and compositionally diverse vegetation present ranging from closed mixed forests to open, beaver-created pools with floating aquatics.....**MONTANE-PIEDMONT 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 Piedmont 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.....**PIEDMONT SEEPAGE WETLAND (WET MEADOW/FEN)** HGM Class: Riverine or Slope

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

3a. Isolated 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.

4a. Located over shallow bedrock or clay hardpans with seasonally perched water tables..... **PIEDMONT UPLAND DEPRESSION SWAMP** HGM Class- Depression

4b. 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. Saturated forests of sloping small stream headwaters, large spring seeps, lateral seeps in ravines and rocky stream bottoms with diffuse drainage patterns. Perennial seepage flow allows for year-round saturation. Braided stream channels, muck-filled depressions, areas of coarse gravel and cobble deposition, and hummock-and-hollow microtopographic features evident.....**MONTANE-PIEDMONT SEEPAGE SWAMP**  
HGM Class: Slope or Riverine

7b. Open, graminoid-dominated meadows and shrub swamps of Piedmont hillside toe slopes and margins of small stream floodplains where saturated conditions persist due to groundwater discharge. Surficial soils predominately organic muck.....**PIEDMONT SEEPAGE WETLAND (WET MEADOW/FEN)** HGM Class: Riverine or Slope



# Piedmont Upland Depression Swamp

Best-condition example (Although outside of riparian area):



Typical example from within disconnected historic floodplain:





# Piedmont Seepage Wetland





# Montane-Piedmont Floodplain





# Montane-Piedmont Seepage Swamp





Spring





# Vernal Pool





# Piedmont KWH Classification Example:

- This is the site you are surveying.
  - The primary water source is groundwater discharge.
  - There are a series of braided channels throughout the wetland.
  - The dominant vegetation is comprised of grasses, sedges, ferns, and shrubby alders.
  - There are sections where the surface soil is an organic muck.



# Piedmont KWH Classification Example:

**Table 12: Maryland Key Wildlife Habitat Classification Key for non-tidal wetland habitats of the Piedmont, 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). Structurally and compositionally diverse vegetation present ranging from closed mixed forests to open, beaver-created pools with floating aquatics.....**MONTANE-PIEDMONT 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 Piedmont 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.....**PIEDMONT SEEPAGE WETLAND (WET MEADOW/FEN)** HGM Class: Riverine or Slope

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

3a. Isolated 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.

4a. Located over shallow bedrock or clay hardpans with seasonally perched water tables..... **PIEDMONT UPLAND DEPRESSION SWAMP** HGM Class- Depression

4b. 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. Saturated forests of sloping small stream headwaters, large spring seeps, lateral seeps in ravines and rocky stream bottoms with diffuse drainage patterns. Perennial seepage flow allows for year-round saturation. Braided stream channels, muck-filled depressions, ~~areas of coarse gravel and cobble deposition~~, and hummock-and-hollow microtopographic features evident.....**MONTANE-PIEDMONT SEEPAGE SWAMP**  
HGM Class: Slope

7b. Open, graminoid-dominated meadows and shrub swamps of Piedmont hillside toeslopes and margins of small stream floodplains where saturated conditions persist due to groundwater discharge. Surficial soils predominately organic muck.....**PIEDMONT SEEPAGE WETLAND (WET MEADOW/FEN)** HGM Class: Riverine or Slope



# Piedmont KWH Classification Example:

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

Key Wildlife Habitat: Piedmont Seepage Wetland HGM Class: Slope

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

Stream Key Wildlife Habitat Type:  Piedmont Stream  Coldwater Stream  Limestone Stream  Piedmont River

- Include NVC Community Type/Plant Association if applicable
- Note the Stream Key Wildlife Habitat Type



# 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 Piedmont 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

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

Depth of O horizon \_\_\_\_\_ Depth of A horizon \_\_\_\_\_ Extensive roots in soil? \_\_\_\_\_ Soil Matrix Hue Value/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.

- 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

<b>Redox concentrations:</b> <input type="checkbox"/> >10% surface area and <input type="checkbox"/> start 0-6" from soil surface <input type="checkbox"/> start >6-12" <input type="checkbox"/> start >12-18" <input type="checkbox"/> <10% surface area and <input type="checkbox"/> start 0-6" from soil surface <input type="checkbox"/> start >6-12" <input type="checkbox"/> None within 18"	<b>Score:</b> _____
<b>Soil Organic Matter:</b> <input type="checkbox"/> Horizon present (any thickness) <input type="checkbox"/> Mineral surface layer(s) $\geq 4$ " thick with matrix value $\leq 3$ and chroma $\leq 2$ <input type="checkbox"/> Mineral surface layer <4" thick and <input type="checkbox"/> Matrix value $\leq 3$ and chroma $\leq 2$ <input type="checkbox"/> Matrix value >3 and $\leq 4$ or chroma >2 and $\leq 3$	<b>Score:</b> _____
<b>Microtopography:</b> <input type="checkbox"/> $\geq 50\%$ of Assessment Area <input type="checkbox"/> 30-49% of AA <input type="checkbox"/> 10-29% of AA <input type="checkbox"/> <10% of AA	<b>Score:</b> _____
<b>Organic Matter Accumulation:</b> 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: <input type="checkbox"/> >75% <input type="checkbox"/> >50-74% <input type="checkbox"/> >25-50% <input type="checkbox"/> $\leq 25\%$	<b>Score:</b> _____
<b>Soil Disturbance:</b> Presence of bare soil due to human activities: <input type="checkbox"/> None/minimal <input type="checkbox"/> Minor/small patches <input type="checkbox"/> Moderate <input type="checkbox"/> Substantial Extent of impact of disturbance: <input type="checkbox"/> None <input type="checkbox"/> Minimal <input type="checkbox"/> Moderate <input type="checkbox"/> Extensive Depth of disturbance and ponding/channeling: <input type="checkbox"/> None <input type="checkbox"/> <2" <input type="checkbox"/> 2-4", some ponding/channeling <input type="checkbox"/> >4", ponding/channeling	<b>Score:</b> _____

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



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

<b>All KWH: Do not score if the floodplain does not naturally have hydric soils and/or does not have functioning hydric soils under current conditions (e.g., relict conditions).</b>	
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.**

<b>All KWH: Do not score if the floodplain does not naturally have hydric soils and/or does not have functioning hydric soils under current conditions (e.g., relict conditions).</b>	
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 $\leq 3$ .

**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:

Mapped Soil Type: Brinklow-Blocktown complex Depth to water table 5.5" Hydric soil?        Hydric soil indicators         
Depth of O horizon N/A Depth of A horizon 6" Extensive roots in soil? No Soil Matrix Hue Value/Chroma         
10YR3/1

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):

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## Soil Biogeochemical Processing:

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"

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  $\leq 3$

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

Organic Matter Accumulation: 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):        %  
% herbaceous/woody + % leaf litter:   $> 75\%$    $> 50-74\%$    $> 25-50\%$    $\leq 25\%$

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

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- 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  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: \_\_\_\_\_

- 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)  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 \_\_\_\_\_

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

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



- 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: \_\_\_\_\_

**Observations/Comments:**

- 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 Tables: Water Source

<b>Montane-Piedmont Floodplain:</b> Groundwater discharge not a major input. For scoring, note stream bank alterations that will affect the riparian water source.		
<b>Score</b>	<b>Assign rating to category with majority of features present:</b>	<b>SCORE _____</b>
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.	
<b>Montane-Piedmont Floodplain:</b> Mixed hydrologic regime with some input from groundwater and from precipitation or limited flooding		
<b>Score</b>	<b>Assign rating to category with majority of features present:</b>	<b>SCORE _____</b>
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 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>	<b>SCORE _____</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

**Montane-Piedmont Floodplain** Note: Recent beaver activity may lead to deviations from rating descriptions. This should be noted on the data sheet.

Low natural variation of hydroperiod \_\_\_\_\_ High natural variation of hydroperiod \_\_\_\_\_

Score	Assign rating to category with majority of features present:	SCORE _____
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.	

## Other KWH

Low natural variation of hydroperiod \_\_\_\_\_ High natural variation of hydroperiod \_\_\_\_\_

Score	Assign rating to category with majority of features present:	SCORE _____
Excellent = 4	Overbank flooding present and recent but not predominant water source to wetland. No unnatural obstructions to lateral or vertical movement of ground or surface water.	
Good = 3	Evidence of overbank flooding but not predominant water source to wetland. Hydroperiod with minor alterations in frequency, levels, or duration due to groundwater and other inputs. Minor restrictions to the lateral or vertical movement of ground or surface waters by unnatural features.	
Fair = 2	Some evidence of overbank flooding, likely during larger storm events. Hydroperiod with moderate alterations in frequency, levels, or duration due to groundwater and other inputs. Moderate restrictions to the lateral or vertical movement of ground or surface waters by unnatural features.	
Poor = 1	Overbank flooding generally no longer occurs. Hydroperiod with substantial alterations in frequency, levels, or duration due to groundwater and other inputs. Substantial restrictions to the lateral or vertical movement of ground or surface waters by unnatural features.	



# Hydrology Example

- The site is a Montane Piedmont Seepage Swamp
  - The site is along a trail within Rachel Carson Park.
  - There is a small channel that feeds into Hawlings River.
  - The plant community is in good condition and there is a healthy population of Sphagnum.
  - The site is continuously saturated.



# 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 sedimentation 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  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: 4**

**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)  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 \_\_\_\_\_ **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:

**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.

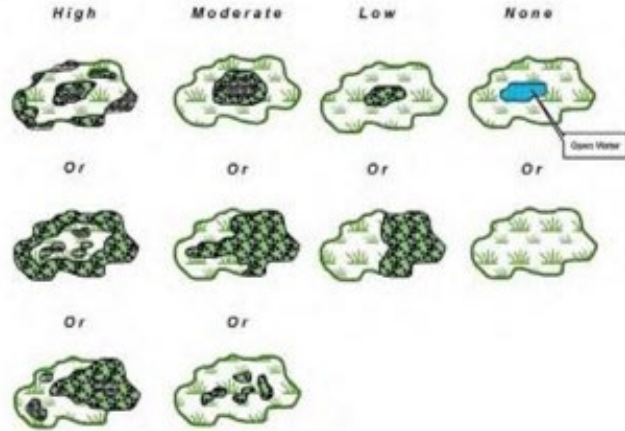
**Interspersion of habitats/physical features** (see examples):  High  Moderate  Low or Minimal  None or Few

**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



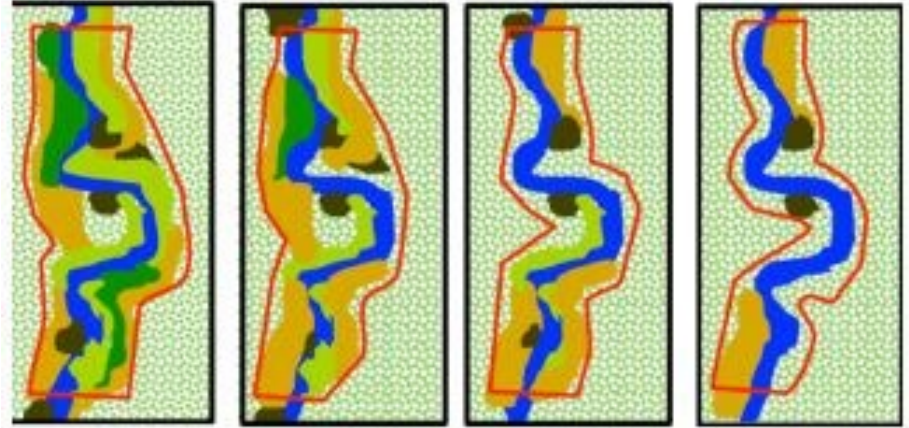
**Montane-Piedmont Seepage Swamp, Piedmont Seepage Wetland, Piedmont Upland Depression Swamp, Vernal Pool, Spring.** (Source: US ACE 2015 Texas Rapid Assessment Method)

**Scoring: High = 4** Vegetation patches are large and intertwined or numerous and scattered

**Moderate = 3** At least two types of vegetation patches are present but patches are slightly smaller or less scattered/intertwined than "High" category

**Low = 2** Two types of vegetation patches are present but in smaller, very localized, and/or isolated patches

**None = 1** Only one type of vegetation patch is present



**A**

**B**

**C**

**Montane-Piedmont Floodplain:** The red box represents the boundary of the AA and each color represents a unique plant zone such as shrub areas, patches of herbaceous vegetation, or tree clumps of different ages or heights. The speckled background represents the background matrix of vegetation and the blue line represents the stream. For multithread stream systems, evaluate the channel with the highest complexity of plant zones for scoring. (Source: California Rapid Assessment Methods for Wetlands Riverine Wetlands Field Book 2013)

**Scoring: A = 4** High complexity of scattered and intertwined plant zones

**B = 3** Moderate complexity of intertwined plant zones

**C = 2** Minimal complexity of plant zones with little interspersion

**D = 1** Few plant zones with localized, isolated patches



# 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: \_\_\_\_\_

**Seepage wetland: 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 :** \_\_\_\_\_

# 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.): \_\_\_\_\_

**Seepage wetland: Woody and/or litter:**  Typical  Human-caused alteration Minor  Moderate  Substantial  Impacted by forest pests/pathogens

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

**Score:**

# Key Wildlife Habitat Scoring:

**Montane-Piedmont Seepage Swamp, Piedmont Seepage Wetland, Piedmont Upland Depression Swamp, Vernal Pool, Spring.** (Source: US ACE 2015 Texas Rapid Assessment Method)

**Scoring: High = 4** Vegetation patches are large and intertwined or numerous and scattered

**Moderate = 3** At least two types of vegetation patches are present but patches are slightly smaller or less scattered/intertwined than “High” category

**Low = 2** Two types of vegetation patches are present but in smaller, very localized, and/or isolated patches

**None = 1** Only one type of vegetation patch is present

**Montane-Piedmont Floodplain:** The red box represents the boundary of the AA and each color represents a unique plant zone such as shrub areas, patches of herbaceous vegetation, or tree clumps of different ages or heights. The speckled background represents the background matrix of vegetation and the blue line represents the stream. For multithread stream systems, evaluate the channel with the highest complexity of plant zones for scoring. (Source: California Rapid Assessment Methods for Wetlands Riverine Wetlands Field Book 2013)

**Scoring: A = 4** High complexity of scattered and intertwined plant zones

**B = 3** Moderate complexity of intertwined plant zones

**C = 2** Minimal complexity of plant zones with little interspersions

**D = 1** Few plant zones with localized, isolated patches

**Table 23. Patch Richness Scoring Metric.** The features present should be noted on the data sheet in addition to any observed wetland- or stream-associated animals such as frogs, waterbirds, crayfish, fish, mussels, etc.

Score	Montane-Piedmont Floodplain, Piedmont Seepage Wetland, Montane-Piedmont Seepage Swamp	Piedmont Upland 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. Interspersions and Patch Richness Metric Rating Criteria.**

Score	Mean of Interspersions 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

## Montane-Piedmont Floodplain, Piedmont Upland Depression Swamp, Montane-Piedmont 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 Montane-Piedmont 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 (≥ 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

<b>Piedmont Seepage Wetland</b>	
<b>Score</b>	<b>Assign rating to category with majority of features present</b>
Excellent = 4	Woody vegetation mortality is due to natural factors. Excellent potential for site recovery given structure present and lack of degradation (past or present). Includes shrub and herb strata (some tall and some short, or primarily short-statured). When present (not too wet), trees are relatively short and stunted and do not form a closed canopy. Shrubs are present as a patchwork or are < 50 cm and open enough to allow for a nearly continuous ground cover of graminoid-dominated vegetation.
Good = 3	Minor negative anthropogenic influences present, or the site is still recovering from major past human disturbances. Mortality or degradation due to grazing, 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. Shrubs and herbs show minor alterations from expected conditions and may be some invasive species cover. A few areas of dense and tall shrubs (> 1 m) or trees may occur. Some trees may have been or killed due to anthropogenic stressors.
Fair = 2	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. Shrub cover or tree cover are beginning to reduce herbaceous cover. Moderate levels of cutting, mowing, browsing, fire or grazing.
Poor = 1	Expected structure is absent or much degraded due to anthropogenic factors or excessive shrub and tree growth. Overall, evidence of degradation includes major cutting, mowing, browsing, fire or grazing. Shrubs and herbs substantially altered from expected conditions. Recovery to minimally disturbed condition is questionable without restoration, or will take many decades.



# Key Wildlife Habitat Scoring Tables: Woody Debris Criteria

**Montane-Piedmont Floodplain, Piedmont Upland Depression Swamp, Montane-Piedmont Seepage Swamp**

**Vernal Pool and Spring: assess presence in immediate surrounding area as well as the basin.**

**If non-natural sources have created standing and/or downed woody debris, indicate this on the data sheet.**

<b>Score</b>	<b>Assign rating to category with majority of features present:</b>	<b>SCORE _____</b>
Excellent = 4	Wide diversity of sizes for both standing and downed logs, including larger sizes [ $> 30$ cm (12 in) diameter 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) diameter 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) diameter 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) diameter 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.	

## **Piedmont Seepage Wetland**

<b>Score</b>	<b>Assign rating to category with majority of features present:</b>	<b>SCORE _____</b>
Excellent = 4	Typical of the system. Mortality of woody vegetation, if present, is due to natural factors.	
Good = 3	Minor alterations to system present. Limited grazing/browsing, timber harvesting, or other anthropogenic factors may be present, but not widespread.	
Fair = 2	Moderate alterations to system present. Ground cover absent from some sections due to disturbance or shading.	
Poor = 1	Substantial alterations to system present. Ground cover absent from large sections due to disturbance or shading.	

# 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

## 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: 3

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

**Seepage wetland: 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 : 4

**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.): \_\_\_\_\_

**Seepage wetland: Woody and/or litter:**  Typical  Human-caused alteration Minor  Moderate  Substantial  Impacted by forest pests/pathogens

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

Score: 4

# Key Wildlife Habitat Module Conclusion

- In this module you learned:
  - How interspersed appears in a variety of of KWH and how to use Fig. 5 from the manual to determine the level of interspersed.
  - What physical features contribute to the score for interspersed/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:

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### *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 Tables: Invasive species

**Piedmont Floodplain, Piedmont Upland Depression Swamp, Montane-Piedmont Seepage Swamp, Piedmont Seepage Wetland**

**Vernal Pool and Spring:** 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 Composition - Piedmont 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%

**Seepage Swamp/Springs: Sphagnum cover -**  Continuous/abundant  Absent from small areas  Reduced  Very low

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

- If unsure of whether or not the plants are “diagnostic natives”, consult the manual.
  - For vernal pools and springs, generally if the plant composition is comprised of mostly or only natives, it is dominated by diagnostic natives to ensure an appropriate score.

# Key Wildlife Habitat Vegetation Composition - Piedmont Native Species Table Part 1:

Key Wildlife Habitat	Trees	Shrubs	Herbs	Vines	Indicator**	Exotic Spp.***
<b>Montane-Piedmont Floodplain (Piedmont section)</b>	<i>Platanus occidentalis, Juglans nigra, Acer negundo, Acer saccharinum, Acer rubrum, Ulmus americana, Liriodendron tulipifera, Fraxinus pennsylvanica, Betula nigra, Carya cordiformis, Celtis occidentalis, Quercus phellos, Quercus shumardii, Quercus bicolor, Quercus palustris</i>	<i>Lindera benzoin, Asimina triloba, Ilex opaca, Ilex verticillata, Carpinus caroliniana</i>	<i>Claytonia virginica, Hydrophyllum canadense, Ranunculus abortivus, Thelypteris noveboracensis, Mitchella repens, Arisaema triphyllum, Boehmeria cylindrica, Saururus cernuus, Cinna arundinacea, Galium circaeans, Medeola virginiana, Thalictrum thalictroides, Impatiens capensis, Glycyeria striata, Mertensia virginica</i>	<i>Toxicodendron radicans, Parthenocissus quinquefolia, Campsis radicans</i>	<i>Platanus occidentalis, Acer negundo, Mertensia virginica,</i>	<i>Alliaria petiolata, Microstegium vimineum, Glechoma hederacea, Rosa multiflora, Ligustrum sinense, and Lonicera japonica</i>
<b>Piedmont Seepage Wetland (Wet Meadow/Fen)</b>	<i>Acer rubrum, Salix nigra</i>	<i>Lindera benzoin, Rosa palustris, Viburnum dentatum, Alnus serrulata, Spirea spp.</i>	<i>Carex stricta, Symplocarpus foetidus, Impatiens capensis, Onoclea sensibilis, Cinna arundinacea, Leersia oryzoides, Juncus effusus, Thelypteris palustris, Scirpus cyperinus, Polygonum spp.</i>		<i>Carex stricta, Symplocarpus foetidus</i>	<i>Rosa multiflora, Microstegium vimineum, Phalaris arundinacea, Phragmites australis, Lythrum salicaria</i>
<b>Piedmont Upland Depression Swamp</b>	<i>Quercus phellos, Quercus palustris, Quercus michauxii, Quercus bicolor, Fraxinus pennsylvanica, Acer rubrum, Nyssa sylvatica</i>		<i>Carex spp.</i>	<i>Smilax rotundifolia</i>	<i>Quercus phellos, Quercus michauxii, Quercus palustris</i>	<i>Phragmites australis</i>
<b>Vernal Pool</b>	Varies	Varies	Varies	Varies		Varies
<b>Spring</b>	Varies	Varies	Varies	Varies		Varies

# Key Wildlife Habitat Vegetation Composition - Piedmont Native Species Table Part 2:

<p><b>Montane-Piedmont Seepage Swamp (Piedmont section)</b></p>	<p><i>Nyssa sylvatica, Acer rubrum, Liriodendron tulipifera, Magnolia virginiana, Fraxinus americana, Fraxinus pennsylvanica, Chionanthus virginicus, Carpinus caroliniana</i></p>	<p><i>Vaccinium corymbosum, Rhododendron viscosum, Ilex verticillata, Viburnum nudum, Viburnum dentatum, Alnus serrulata, Rhododendron periclymenoides, Lindera benzoin, Rubus hispidus, Kalmia latifolia</i></p>	<p><i>Symplocarpus foetidus, Veratrum viride, Osmundastrum cinnamomeum, Impatiens capensis, Pilea pumila, Carex folliculata, Chelone glabra, Thelypteris noveboracensis, Osmunda regalis, Viola cucullata, Thalictrum pubescens, Arisaema triphyllum, Carex atlantica, Glyceria striata, Cinna arundinacea, Boehmeria cylindrica, Lycopus virginicus</i></p>	<p><i>Smilax rotundifolia, Toxicodendron radicans, Parthenocissus quinquefolia</i></p>	<p><i>Sphagnum spp., Symplocarpus foetidus, Veratrum viride, Magnolia virginiana</i></p>	<p><i>Microstegium vimineum</i></p>
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# Native Species Indicating Disturbance

*Phalaris arundinacea*

*Dichanthelium boscii*

*Typha latifolia*

*Dichanthelium sphaerocarpon*

*Elymus glabriflorus*

*Paspalum floridanum*

*Muhlenbergia schreberi*

*Echinochloa muricata*

*Carex blanda*

*Carex frankii*

*Coleataenia anceps*

*Dichanthelium scoparium*

*Panicum dichtomiflorum.*

# 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** \_\_\_\_\_

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# Key Wildlife Habitat Vegetation Tables: Native species

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

<b>Montane-Piedmont Floodplain, Piedmont Upland Depression Swamp, Montane-Piedmont Seepage Swamp, Piedmont Seepage Wetland</b>	
<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 Montane-Piedmont Floodplain. This should be noted on the data sheet and taken into account.</p>	
<b>Score</b>	<b>Assign rating to category with majority of features present</b>
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>Montane-Piedmont Seepage Swamps, some Springs: <i>Sphagnum</i> is 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>Montane-Piedmont Seepage Swamps, 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>Montane-Piedmont Seepage Swamps, some Springs: <i>Sphagnum</i> cover reduced but still regenerating in open areas.</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>

# 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://universalfqo.org/> as an alternative

# Key Wildlife Habitat Vegetation Composition Example:

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

Species:	Absolute % Cover:	C-Value If Native S <sub>i</sub>
<b>Tree Stratum: woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger</b>		
1 <i>Liriodendron tulipifera</i>	15	5
2 <i>Quercus palustris</i>	10	5
3 <i>Platanus occidentalis</i>	5	5
4 <i>Acer rubrum</i>	3	1
5		
6		
7		
<b>Sapling/Shrub Stratum: woody plants, excluding woody vines, less than 3 in. (7.6cm) DBH and greater than 3.28 ft (1 m) tall</b>		
1 <i>Lindera benzoin</i>	25	5
2 <i>Rosa multiflora</i>	4	non-native
3 <i>Acer rubrum</i>	2	1
4		
5		
6		
7		
8		
9		
<b>Herb Stratum: all herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and all other plants less than 3.28 ft (1 m) tall</b>		
1 <i>Impatiens capensis</i>	20	3
2 <i>Ansaema triphyllum</i>	10	5
3 <i>Boehmeria cylindrica</i>	10	5
4 <i>Microstegium vimineum</i>	4	non-native
5 <i>Alliaria petiolata</i>	2	non-native
6 <i>Lysimachia nummularia</i>	3	non-native
7 <i>Carex stipata</i>	3	3
8 <i>Cinna arundinacea</i>	2	5
9		
10		
11		
<b>Woody Vine Stratum: all woody vines, regardless of height</b>		
1 <i>Lonicera japonica</i>	2	non-native
2 <i>Smilax rotundifolia</i>	3	2
3 <i>Parthenocissus quinquefolia</i>	2	3
4 <i>Toxicodendron radicans</i>	2	1
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: 2

### *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%

Seepage Swamp/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 **3.7** :  >4  3-4  <3-2  <2

Adjusted FQI **31.4**

Score: 3

# 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 Piedmont 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.

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	2	(Sum of metric scores: <u>13</u> ) / 4 = <u>3.25</u>	0.3	0.975
	Buffer Condition	4			
	Aquatic Context	4			
	Comparative Size	3			
Soil/Substrate* * If only Microtopography, Organic Matter Accumulation, and Soil Disturbance were scored, divide by 3 rather than 5	Redox Concentrations	1	(Sum of metric scores: <u>16</u> ) / 5 or /3* = <u>3.2</u>	0.1	0.32
	Microtopography	4			
	Soil Organic Matter	3			
	Organic Matter Accumulation	4			
	Soil Disturbance	4			
Hydrology	Water source	4	(Sum of metric scores: <u>12</u> ) / 3 = <u>4</u>	0.2	0.8
	Channel	4			
	Hydroperiod and Hydrologic Connectivity	4			
Key Wildlife Habitat and Vegetation Composition	Interspersion/Patch Richness	3	(Sum of metric scores: <u>20</u> ) / 6 = <u>3.33</u>	0.4	1.332
	Vertical Structure	4			
	Coarse Woody Debris	4			
	Invasive Species	2			
	Native Species Composition	4			
	Floristic Quality Assessment	3			
<b>Sum of Overall Core Factor Scores = Overall KWH Ecological Integrity Assessment (EIA) Score:</b>					<b>3.427</b>
<p>Note the presence of these unique features in the project area using the check boxes.  <b>Add additional Points [F] the Overall EIA score is not "Excellent"</b> for each of the following:            From WRR layers (see Manual Section 3.5): Mark all categories present in WRR layers. Assign the single highest score for a maximum of +0.2 for WRR layers:</p> <p><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 checked="" type="checkbox"/> Targeted Ecological Area (+ 0.1)  <input type="checkbox"/> Sensitive Species Project Review Area (+ 0.1)            From MDE Tier II High Quality Waters (Section 3.5):  <input type="checkbox"/> Upstream of, within, or adjacent to Tier II High Quality stream segment (+ 0.2)            From StreamStats (see Manual Section 3.5):  <input type="checkbox"/> Impervious surface area for project area basin is low (&lt;5%) (+ 0.2)  <input type="checkbox"/> Forest cover in project area basin is &gt;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"/> Sensitive species (colonial waterbird nesting colony, native mussel bed, anomorous fish) (+ 0.1)  <input type="checkbox"/> Dominated by native trees greater than 30cm or 12" 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)</p>					<b>+0.2</b>
<b>FINAL Key Wildlife Habitat Ecological Integrity Assessment SCORE and RATING:</b>					<b>3.627 Excellent</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.