



Maryland
Department of
the Environment

Considerations for Riparian Areas in a Stream Mitigation Assessment

**Denise Clearwater
Wetlands and Waterways Program
Maryland Department of the Environment**

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- **MDE, USACE, USFWS, EPA are sub-group of MD IRT Working to Develop Recommendations and Methods for Assigning Credit for Stream Mitigation Proposals**
 - **Protocols for Stream Mitigation Lag Behind Wetland Assessments and Crediting**
 - **Mitigation Bankers Requesting Credits for Combined Wetland/Stream Banks**

The Presentation Does Not Represent Final Recommendations of Sub-Group to MD IRT, But Are Factors to Consider



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- **In 2015-2016, USFWS Adapted Stream Functional Pyramid Assessment and Created Checklists for Common Stream Restoration Proposals in MD**
 - **Despite Integrated Processes of Stream/Adjacent Wetlands/Floodplains, Riparian Area Component Very Limited**



Metrics Limited to Width of Riparian Zone, General Mention of Human Activities, Description Required Presence of 3 Strata to be “Functioning”

Need Better Understanding of Condition and Function of Riparian Area at Both Impact and Mitigation Sites to Evaluate Resource Loss and Compensation through Mitigation



Several Levels of Assessment

Default Presumption of Loss Based on Project Type

Most Rapid and Predictable

May Not Reflect Actual Conditions

Rapid Assessment

Field and Office information

Detailed Assessment

Better Predictor of Loss and Replacement



Rapid Assessment

Maximize Use of Information on Wetland Delineation Form

Provides information Not Only on Number of Strata, But Individual Species

Can Consider % of Invasive Species

Sources of Hydrology – evidence of overbank flooding, groundwater

Soil Types and Characteristics



If Lacking Comprehensive Reference Site Information For Streams or Wetlands, Consider Key Wildlife Habitats from State Wildlife Action Plan

Benefit of Using Key Wildlife Habitats

- **Description of System, Typical Plants, and Wildlife Species of Greatest Conservation Need, Reference Areas**
- **Useful for Considering Lost/Replacement of Same Resource Type**

Compatible with NatureServe Ecological Classification System, Northeastern Terrestrial Wildlife Classification System, and Northeastern Aquatic Habitat Classification System



Streams by MD Key Wildlife Habitats

Coldwater Stream

Limestone Stream

Highland Stream

Piedmont Stream

Coastal Plain Stream

Blackwater Stream

**Highland River
order or larger)**

Piedmont River

Coastal Plain River (5th



But..Streams and Overbank Flow May NOT Be Dominant Hydrology Component of Stream/Wetland/Floodplain Complex

Some Systems Are Dominated by Groundwater***

Nontidal Wetland Key Wildlife Habitats Associated with Headwater Streams:

Piedmont Seepage Wetland***

**Coastal Plain Flatwood and Depression
Swamp*****

Montane Bog and Fen***

Coastal Plain Seepage Swamp***

Montane-Piedmont Acidic Seepage Swamp***

Vernal Pool

Coastal Plain Seepage Bog and Fen***

**Montane-Piedmont Basic Seepage
Swamp*****

Key Wildlife Habitats Associated With Larger Rivers:

May be Primarily Upland or Wetland, and May Contain Vernal Pools:

Montane Piedmont Floodplain

Coastal Plain Floodplain



What does This Mean for Determining Credits for Stream Mitigation and Lost Functions?

Determine if this is stream/wetland complex (stream is small part of riparian valley), or stream with narrow floodplain/riparian area), or predominantly upland floodplain. Evaluate dominant source of hydrology influencing riparian system-overbank flooding, groundwater, surface runoff, precipitation.

Rationale: Characterization of the existing area will provide information about its functions, as well as opportunities for improvement; and additional regulatory requirements and management objectives.



For stream/wetland complexes, where stream is relatively small component of system, or the wetland is not primarily supported by overbank flooding...

If Mitigation is Required for Either Wetland or Stream Loss...

Consider Not Distinguishing Between Resources for Mitigation Credits, and Allowing Credit for Both Streams and Wetlands if Intact System is Restored or Adequately Enhanced at the Bank or Permittee Mitigation Site.



However,

Consider *LIMITING* Amount of Bank Credit or *Use* for Replacements of Different Key Wildlife Habitats and Stream Types.

For example, headwater vs. mainstem, Resources in Different Physiographic Regions

Otherwise, Lost Functions May Not Be Replaced

Challenge is Requirement for Large Service Areas for Mitigation Banks



Other Factors and Questions to Consider About Riparian Areas in Determining Stream Mitigation Credit

Are Other Wetland/Aquatic Features Present?

Vernal pools, Backswamps, springs, seeps.

Rationale: The features provide additional heterogeneity for habitat. Springs and seeps may provide base flow and reduce water temperatures.

Designs should not reduce existing benefits of these features. Award additional credit if the features are naturally present in this key wildlife habitat, but are not present due to alteration and are proposed in the mitigation design.



Should credit be adjusted for width of buffer and associated functions, but consider what is natural for site e.g. reference sites?

Rationale: Buffers require varying widths to meet certain functional objectives. The minimum used in MD for some funding programs is 35 feet, but this only benefits water quality and shoreline stabilization.

For Functional Replacements, Consider Assigning Credit For Buffers Which Help Replace lost Functions



FR: Chesapeake Bay Riparian Handbook; A Guide for Establishing and Maintaining Riparian Forest Buffers

Water quality	5-30m
Stream stabilization	10-20m
Riparian habitat	30-500m+
Flood attenuation	20-150m
Detrital Input	3-10m

Consider Also Increasing Buffer Width As Slope Increases

BUT...Ability to Have Wide Buffers May Be Limited. Consider Adjusting Other Requirements to Offset Functional Losses



Are the number, composition, and condition of strata characteristic of the appropriate key wildlife habitat present on the site?

Rationale: The Maryland Wildlife Action Plan Has Already Identified the Key Wildlife Habitats Associated with Species of Greatest Conservation Need. Consideration of These Areas as Impact and Mitigation Sites Will Support Sound Wildlife Management.

Most KWH Riparian Areas in MD Are Dominated by Forest, with Closed or Semi-Open Canopy Due to Beaver Influence. Typically There are at Least 3 Strata (forest/shrub/emergent), But Be Aware of Exceptions.



Consider Stressor Metrics for Corrective Actions, Such as Addressing and Managing Invasive Species, and Replacing Missing Strata.

Vegetation stress – e.g. browse, flooding*, drainage/drought, disease/insects

Some, but Not Excessive Extended Flooding/Ponded Areas* from Beaver Impacts May Be Natural Part of Ecosystem

% cover each strata

% bare ground

% invasive species



Potential Soil Metrics in Riparian Area Affecting Stream Mitigation Crediting

Rationale: Biogeochemical processes for nutrient and carbon cycling, as well as plant growth and survival, depend upon healthy soil structure and biota. Mitigation sites may require substantial preparation to effectively support riparian vegetation and function.

Will measures at mitigation site address compacted soils, expose buried soils, and groundwater discharge?



Does Soil Match Description in Soil Survey?

Is soil compacted?

Is the soil drained?

Is there microtopography?

Is there debris or trash?

Is there an O horizon?

Are there buried soils with an organic layer?

**Are there buried soils with an organic layer, gravel,
and coldwater discharge?**

Most of This Information Can Be Observed During Delineation



FR. MD Soil Health Card

Indicator Table			
Indicator	Poor	Medium	Good
<i>Earthworms</i>	0-1 worms in shovelful of top foot of soil. No casts or holes.	2-10 in shovelful. Few casts, holes, or worms.	10+ in top foot of soil. Lots of casts and holes in tilled clods. Birds behind tillage.
<i>Organic Matter Color</i>	Topsoil color similar to subsoil color.	Surface color closer to subsoil color.	Topsoil clearly defined, darker than subsoil.
<i>Organic Matter Roots/Residue</i>	No visible residue or roots	Some residue few roots	Noticeable roots and residue
<i>Subsurface Compaction</i>	Wire breaks or bends when inserting flag.	Have to push hard, need fist to push flag in.	Flag goes in easily with fingers to twice the depth of plow layer.
<i>Soil Tilt Mellowness Friability</i>	Looks dead. Like brick or concrete, cloddy. Either blows apart or hard to pull drill through.	Somewhat cloddy, balls up, rough pulling seedbed.	Soil crumbles well, can slice through, like cutting butter. Spongy when you walk on it.
<i>Erosion</i>	Large gullies over 2 inches deep joined to others, thin or no topsoil, rapid run-off the color of soil.	Few rills or gullies, gullies up to two inches deep. Some swift runoff, colored water.	No gullies or rills, clear or no runoff.
<i>Water Holding Capacity</i>	Plant stress two days after a good rain.	Water runs out after a week or so.	Holds water for a long period of time without puddling.
<i>Drainage, Infiltration</i>	Water lays for a long time, evaporates more than drains, always very wet ground.	Water lays for short period of time, eventually drains.	No ponding, no runoff, water moves through soil steadily. Soil not too wet, not too dry.
<i>Crop Condition (How well it grows)</i>	Problem growing throughout season, poor growth, yellow or purple color.	Fair growth, spots in field different, medium green color.	Normal healthy dark green color, excellent growth all season, across field.
<i>pH</i>	Hard to correct for desired crop.	Easily correctable.	Proper pH for crop.
<i>Nutrient Holding Capacity</i>	Soil tests dropping with more fertilizer applied than crops used.	Little change or slow down trend.	Soil tests trending up in relation to fertilizer applied and crop harvested.



Effectiveness of Riparian Buffer

Will actions at mitigation site address factors causing a reduction in riparian area function?

Rationale: An evaluation of existing conditions is necessary to ensure that impacts and mitigation do not unnecessarily reduce existing functions, as well as identifying the deficiencies which may be addressed and credited through appropriate enhancements.

This metric may be a combination of buffer width and extent and type of vegetation, plus other metrics as discussed.

What Have Others Done?



FR. NRCS Visual Stream Assessment

Element 4 Riparian area quantity

	Natural plant community extends at least two bankfull widths or more than the entire active flood plain and is generally contiguous throughout property		Natural plant community extends at least one bankfull width or more than 1/2 to 2/3 of active flood plain and is generally contiguous throughout property Vegetation gaps do not exceed 10% of the estimated length of the stream on the property		Natural plant community extends at least 1/2 of the bankfull width or more than at least 1/2 of active flood plain Vegetation gaps do not exceed 30% of the estimated length of the stream on the property		Natural plant community extends at least 1/3 of the bankfull width or more than 1/4 of active flood plain Vegetation gaps exceed 30% of the estimated length of the stream on the property			Natural plant community extends less than 1/3 of the bankfull width or less than 1/4 of active flood plain Vegetation gaps exceed 30% of the estimated length of the stream on the property	
Right bank	10	9	8	7	6	5	4	3	2	1	0
Left bank	10	9	8	7	6	5	4	3	2	1	0

Note: Score each bank separately. Scores should represent the entire stream riparian area within the property. Score for this element = left bank score plus right bank score divided by 2. If the score of one bank is 7 or greater and the score of the other bank is 4 or less, subtract 2 points from final score.



Fr. NRCS Visual Stream Assessment cont.

Element 5 Riparian area quality

Natural and diverse riparian vegetation with composition, density and age structure appropriate for the site		Natural and diverse riparian vegetation with composition, density and age structure appropriate for the site: Little or no evidence of concentrated flows through area			Natural vegetation compromised			Little or no natural vegetation			
No invasive species or concentrated flows through area		Invasive species present in small numbers (20% cover or less)			Evidence of concentrated flows running through the riparian area Invasive species common (>20% <50% cover)			Evidence of concentrated flows running through the riparian area Invasive species widespread (>50% cover)			
Right bank	10	9	8	7	6	5	4	3	2	1	0
Left bank	10	9	8	7	6	5	4	3	2	1	0

Notes: Score should represent the entire stream riparian area within the property.
Score for this element = left bank score plus right bank score divided by 2.



Fr. NRCS Visual Stream Assessment cont.

Element 6 Canopy cover

(a) Cold-water streams

>75% of water surface shaded within the length of the stream in landowner's property	75–50% of water surface shaded within the length of the stream in landowner's property	49–20% of water surface shaded within the length of the stream in landowner's property	<20% of water surface shaded within the length of the stream in landowner's property
10 9	8 7 6	5 4 3	2 1 0

(b) Warm-water streams

50–75% of water surface shaded within the length of the stream in landowner's property	>75% of water surface shaded within the length of the stream in landowner's property	49–20% of water surface shaded within the length of the stream in landowner's property	<20% of water surface shaded within the length of the stream in landowner's property
10 9	8 7 6	5 4 3	2 1 0



Fr. Maryland Biological Stream Survey

<p>9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.</p> <p>SCORE ____ (LB) SCORE ____ (RB)</p>	<p>More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.</p>	<p>70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.</p>	<p>50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.</p>	<p>Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.</p>
	<p>Left Bank 10 9</p>	<p>Left Bank 8 7 6</p>	<p>Left Bank 5 4 3</p>	<p>Left Bank 2 1 0</p>
	<p>Right Bank 10 9</p>	<p>Right Bank 8 7 6</p>	<p>Right Bank 5 4 3</p>	<p>Right Bank 2 1 0</p>



Maryland Biological Stream Survey cont.

<p>10. Riparian Vegetative Zone Width (score each bank riparian zone)</p>	<p>Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.</p>	<p>Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.</p>	<p>Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.</p>	<p>Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.</p>
<p>SCORE ___ (LB)</p>	<p>Left Bank 10 9</p>	<p>Left Bank 8 7 6</p>	<p>Left Bank 5 4 3</p>	<p>Left Bank 2 1 0</p>
<p>SCORE ___ (RB)</p>	<p>Right Bank 10 9</p>	<p>Right Bank 8 7 6</p>	<p>Right Bank 5 4 3</p>	<p>Right Bank 2 1 0</p>



Large Woody Debris

“Most LWD debris originates within 60 feet of a stream, so it is imperative that the riparian forest is established if fish habitat is to be maintained. Ideally, streams supporting fish should have 75 to 200 pieces of large woody debris per stream mile.”

“Quantities of large woody debris (LWD) recommended for healthy streams in the George Washington National Forest in Virginia range from 34 pieces of LWD per km for warm water fisheries to 136 pieces/km for cold water fisheries.”

Both fr. “Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Forest Buffers”

*****Consider also orientation of debris in stream**



Healthy Streams Require a Fully Functioning Riparian Areas

Fully Functioning Riparian Areas Are Dominated by Appropriate Native Vegetation; Natural Patterns of Surface and Groundwater Inundation and Saturation, and Intact, Non-Compacted Soil Profiles

Question for Stream Crediting Determination:

Will Mitigation Proposal Address Deficiencies in Riparian Corridor?



Next Steps

- **Present considerations and recommendations to IRT**
- **Discuss how favorable considerations and recommendations would actually be implemented**
- **IRT makes decisions on what to include as policy**



Questions or Comments Welcome

**Denise Clearwater
Special Projects Coordinator
Wetlands and Waterways Program
Maryland Department of the Environment
1800 Washington Blvd.
Baltimore, MD 21230
denise.clearwater@maryland.gov**