APPENDIX B: EXAMPLE METRIC PHOTOS

Figure B1 Aquatic Context Metric. The aquatic context metric is evaluated by drawing a polygon extending from the WAA boundary (blue polygon) outward 1000 feet (red polygon). All aquatic resources within the polygon are counted. The red points are wetlands (8) and blue points are streams (2), for a total of 10 aquatic resources within the 1000’ polygon. This depressional wetland in the EMP ecoregion would score “4” for this metric. Source: Watershed Resource Registry (WRR).

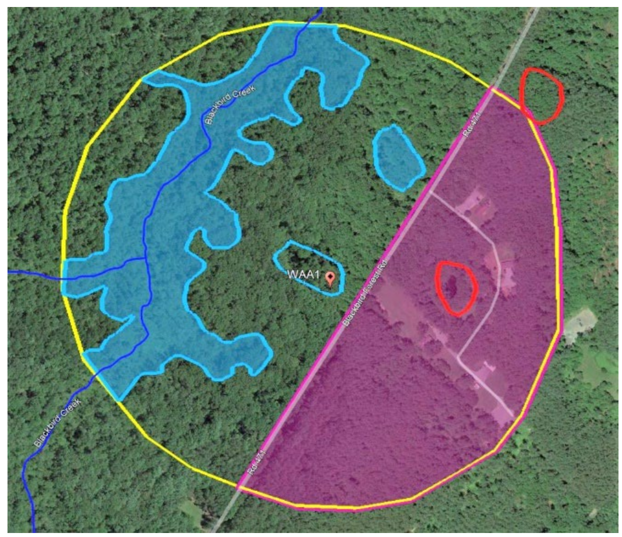


Figure B2 Aquatic Context Metric. Another example of evaluating the aquatic context metric. Count all aquatic resources within 1000 feet (yellow polygon) of the WAA boundary. In this situation where a large wetland is present, determine how much of the total acreage is covered by the wetland. In this case, ~20% of the polygon, so the large wetland counts as two resources, one for each 10% of coverage. In addition, there is one smaller wetland and two streams for a total of five resources. The medium duty road is considered a barrier; therefore, any aquatic resources (red polygons) outside of the road barrier are not counted as the connection to the WAA has been severed as described in the MDWAM Guidebook. This WAA is in the CP ecoregion and would score a “2” for this metric.

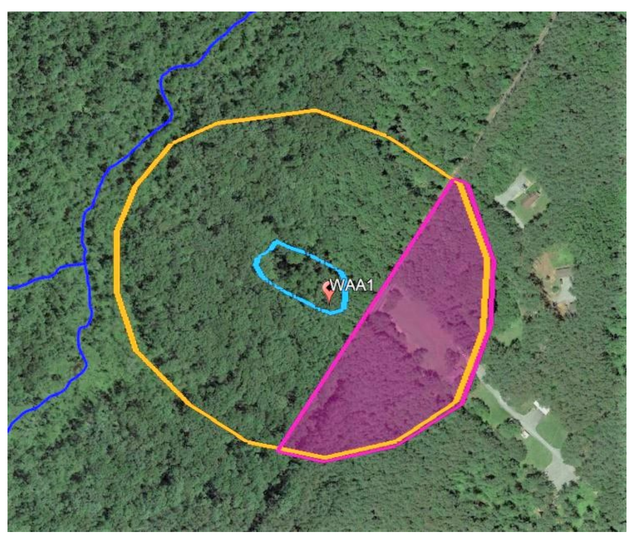
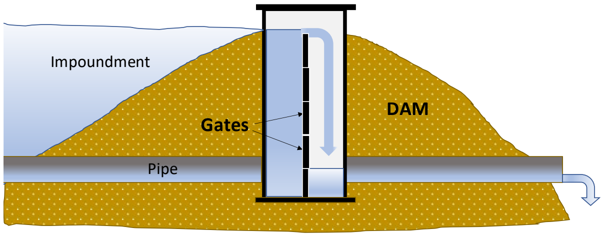


Figure B3 Buffer Metric. The buffer score is calculated by drawing a polygon extending 500 feet (orange polygon) outward from the WAA boundary. The percentage of all potential buffer types within the polygon are determined (excluding the WAA acreage) and multiplied by the values described in the scoring narratives. They are totaled and rounded to the first decimal point.

As described in the Guidebook, areas outside of a potential barrier, the medium duty road in this case, are scored “0” as they are no longer available as a buffer to the wetland (regardless of type). The polygon at right is ~ 73% mid to late successional forest (value 4 x 0.73 = 2.9 for this type). The remaining 27% is considered non-buffer (the road and areas beyond this barrier) with a value of “0”. This wetland would receive a buffer score of 2.9.

Figure B4 Water Source Metric (artificial control). Slotted weirs to control water levels in wetlands are a form of artificial control of a water source which impacts hydrologic processes. Management of "green tree" reservoirs disrupts the flow and circulation of waters within a wetland impacting a water source and several other MDWAM metrics such as hydroperiod, hydrologic flow, plant strata, species richness and others. This forested wetland in Montgomery County is seasonally flooded to promote waterfowl habitat. This wetland would score moderately for this metric due to the high artificial control from this structure.

Figure B5 Water Source Metric (artificial control). Agri-drains are another common water control device used to manipulate water levels in wetlands. In addition to wildlife management areas, many restoration and mitigation areas have water control structures such as this. Wetlands with these structures would typically score moderate to low due to the potential for high control.



Agri-drain water control structure

Figure B6 Hydroperiod Metric. Pictured above, two depression wetlands in the CP ecoregion with low variation of the hydroperiod. Low variation generally scores a maximum of "3" as the prolonged hydroperiod often has a negative effect to several of the biotic core element metrics such as species richness and plant strata. Both photos illustrate the lack of strata in the wet and dry seasons. Low variation is also reflected in the types of functions the wetland can perform.

Figure B7 Hydroperiod Metric. This perennially saturated fen (backslope subclass) in Garrett County (left) is another example of low variation of the hydroperiod. This backslope wetland in Cunningham Falls (right) State Park is an example of perennial saturation and low variation of the hydroperiod. As above, these wetlands in the EMP ecoregion would each score a “3” for hydroperiod. Low species richness and organic accumulation are common indicators of low variation.

Figure B8 Hydroperiod Metric. Example of a toe slope wetland with high variation of the hydroperiod (Joe Branch, Carroll County) in the EMP ecoregion. This wetland would score “4” for the hydroperiod metric. High species richness, lack of organic accumulation and redoximorphic concentrations near the surface are indications of high variation in this case.

Figure B9 Hydrologic Flow Metric. An example of a riverine wetland (active floodplain subclass, left) that would receive a high score for this metric. The fresh coating of sediment throughout the area is an indicator of high flowthrough. That is, high movement of water to and from the wetland as well as high openness to hydrologic fluxes. These wetlands have soils that do not accumulate large amounts of organics due to the high flowthrough and high variation of the hydroperiod. The stratified soil profile on the right suggests that flooding events are recurring and extreme. Note the buried organics in this stratified soil profile.

Figure B10 Hydrologic Flow Metric. This example of a riverine wetland (active floodplain subclass) also illustrates a wetland that would receive a high score for this metric. Note the large amount of floatable debris at the bases of the trees indicating high flowthrough. The transport of organics and sediments are important to the function of the wetland (e.g., carbon import or export, sediment retention, nutrient cycling, etc.) when they occur at natural rates.

Figure B11 Hydrologic Flow Metric. This example illustrates indicators of low flowthrough and openness in this depressional wetland in the EMP ecoregion. Dead standing timber, floating plants (*Lemma minor*) and flood tolerant shrubs such as buttonbush (*Cephalanthus occidentalis*) are indicators of stagnant or low movement of water. Other indicators of low flowthrough include water-stained leaves, algal mats, debris dams, iron deposits, constricted outlets, and surface roughness.

Figure B12 Surface Drainage Feature Metric. This example of a toe slope wetland (left) along Mill Swamp (Charles County - CP ecoregion) illustrates how an incised channel can impact wetland hydrology by lowering and even eliminating the water table in an adjacent wetland. Because the stream channel has become incised and no longer exhibits regular overbank flooding, groundwater discharge from the valley fringe is now the dominant water source to the wetlands. The wetland would score low for this metric as the incised channel has an ongoing negative effect on the water table of the adjacent wetlands.

Figure B13 Surface Drainage Feature Metric. In contrast to Figure B12, the channel of this riverine wetland (swamp forest subclass) adjacent to Nassawango Creek (Somerset County – CP ecoregion) is not negatively affected and scores a “4” for the surface drainage feature.

Figure B14 Surface Drainage Feature Metric. Surface drainage features include man-altered streams (ditched/excavated) as in this photo. This surface drainage feature has more than a minimal ongoing negative effect on the adjacent wetland hydrology (depression). The surface water level and water table have been significantly impacted and therefore would score “1” for this metric.

Figure B15 Surface Drainage Feature Metric. Surface drainage features also include ditches and swales but do not always have a significant effect on a wetland. The historic ditch in this photo has minimal or no negative effect on the adjacent wetlands. Therefore, it would score high for this metric. Of note, mineral flat wetlands have many miles of historic ditches from past agriculture and silviculture activities throughout the coastal plain. Many of which have little or no effect on the wetlands. Therefore, an investigator must be familiar with soil types and textures to determine the potential effect of old ditches.

Figure B16 Organic Carbon Storage Metric. Soils with thick organic or dark mineral surfaces score high for this metric. They indicate accumulation of organic materials due to extended hydroperiods during their development. The photo on the left is from a backslope fen in Garrett County (histic epipedon) and the photo on the right is from a mineral flat wetland in Queen Annes County (umbric surface). Accurate and complete soil profile characterization during wetland delineations will provide the necessary data to evaluate this metric.

Figure B17 Soil Organic Carbon Metric Illustration of values and chromas that would meet criteria for dark mineral surface, score 1, and score 0 in the soil organic carbon storage metric. The illustration shows the 10YR hue, but scoring criteria is the same for all hues (e.g., mineral surface layers with colors 7.5YR 4/2, 10YR 4/2, and 2.5Y 4/2 would all meet the criteria for a score of 1). For dark mineral surface layers, also consider the layer(s) thickness when scoring the metric. Due to differences in color reproduction, do not use this figure to determine soil colors in the field.

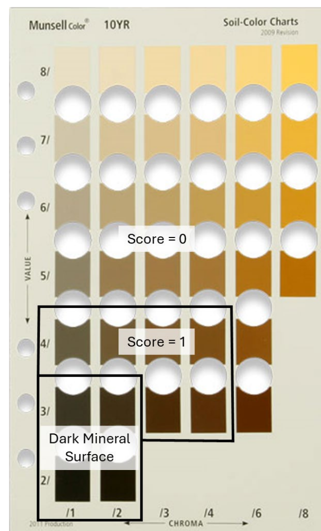


Figure B18 Biogeochemical Cycling (BGC) Metric. The BGC metric combines four sub metric scores to determine if important nutrient and chemical cycling functions are likely in the soil profile. The two soil profiles indicate high variation of the hydroperiod as common to many redoximorphic concentrations are located near the soil surface. Organic carbon storage, herbaceous cover and microtopography are other sub metrics that are measured to determine the overall BGC score. Soils with a depleted matrix can score high for this metric.

Figure B19 Sedimentation Metric. The photo on the left (Kent County) provides an example of sedimentation that is of a natural amount. The photo on the right (Anne Arundel County) also exhibits a natural rate of sedimentation as evidenced by the coated leaves in the foreground. These sediments were suspended by overbank flood waters and deposited far from the channel. In both cases, the wetlands would probably score a "4" for this metric.

Figure B20 Sedimentation Metric. The sedimentation in this photo (Anne Arundel County) illustrates excessive and widespread sedimentation which would score a "1". The sedimentation is a product of frequent destructive flooding events from urbanization of the watershed.

Figure B21 Soil Modification Metric. There are many indicators of human soil modifications such as land clearing, grading, tillage, and compaction to name a few. Recent alterations can often be very clear but past alterations and the degree of recovery often depend on the extent and severity of the alteration. These photos illustrate the effects of compaction from heavy equipment. The soil on the left is compacted near the surface while the photo on the right is compacted lower in the profile. In both cases, the effects can be long lasting.

Figure B22 Soil Modification Metric. Legacy sediments are another form of human soil modifications resulting from historic dams, agricultural and other disturbances. In both photos, an original F3 hydric soil indicator has been buried by years of sedimentation. These sediments have since developed redoximorphic features now expressed as an F19 indicator (Piedmont floodplain soils). Note the original dark surfaces below the F19 indicator.

Figure B23 Soil Modification Metric. The severity of the alteration and its potential effect on soil recovery (morphological development) must be determined in scoring this metric. Tillage of the soil may not have as severe effect as other disturbances such as filling, grading, and dredging. This is a backslope wetland in Harford County.

Figure B24 Topographic Complexity Metric. This metric measures the surface roughness which is expressed as microtopographic elevation change (3–6-inch change in surface elevation) or as a gradient or bench (>6-inch change). This wetland has moderate microtopography but because it has two gradients it would score high. The distinct vegetative communities reflect the change in gradient.

Figure B25Topographic Complexity Metric. This hardwood mineral flat has only one gradient but greater than 50% microtopography. This wetland would score “4” for this metric. Notice the alternating micro highs and lows. This provides diversity in habitat and variation in duration of soil saturation.

Figure B26 Topographic Complexity Metric. This wetland has two gradients but low microtopography (10-29%) and would score moderate for this metric.

Figure B27 Edge Complexity Metric (horizontal). These Delmarva Bay wetland depressions typically have very low horizontal edge complexity and are surrounded by upland forest (low vertical complexity) resulting in a low score for this metric.

Figure B28 Edge Complexity Metric (horizontal). This wetland has very high horizontal edge complexity. Note the interconnecting fingers of wetlands and irregular boundaries.

Figure B29 Edge Complexity (vertical). This wetland illustrates high vertical edge complexity in the two photos above. Note the drastic change in vertical structure from herb to shrub on the left and from herb/shrub to forest on the right which elevates ecotone. This increases the overall score for edge complexity**.**

Figure B30 Physical Habitat Richness Metric – Secondary channels. These are seasonally active secondary channels that conduct surface flows seasonally and during high water periods. They generally exhibit channel morphology and are often ponded between flow episodes.

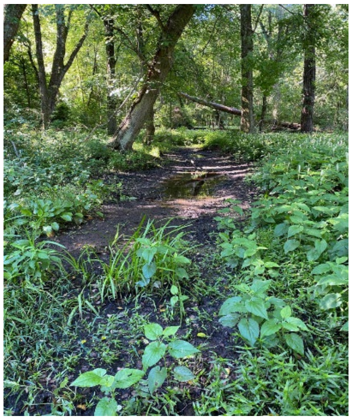


Figure B31 Physical Habitat Richness Metric – Seasonally inundated swales. Concave features that can conduct seasonal flows but are typically ponded most of the time. Flows are generally they are sluggish and do not produce well defined stream morphological characteristics. The are often unvegetated but may fill in with herbaceous vegetation during the dry season often causing them to be overlooked as shown in the right photo.


Figure B32 Physical Habitat Richness Metric – Unvegetated pools. These areas provide seasonal to permanent habitat for semi-aquatic and other wildlife species. Water-stained leaves and sparsely vegetated concave surfaces are hydrologic field indicators associated with physical habitat richness. Wood frogs and spring peepers are common inhabitants. They are distinguished from unvegetated swales by lacking a physical connection to a drainage feature.

Figure B33 Physical Habitat Richness Metric – Unvegetated flats. Areas of sediment or rock lacking vegetation seasonally or perennially that present potential resting and feeding area for shore birds, wading birds, waterfowl, etc. Exposed shorelines along impoundments or streams during natural or manipulated drawdown.

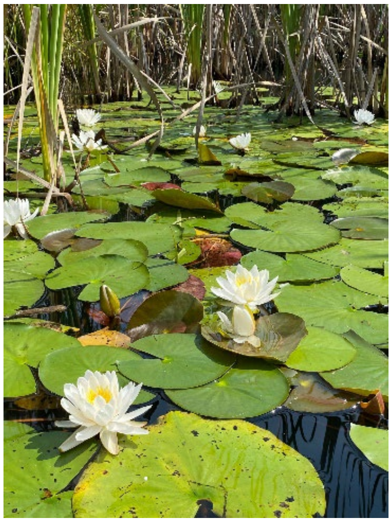

Figure B34 Physical Habitat Richness Metric – Vegetated islands. An area of land above the normal high-water level that is usually surrounded by open water and supports macrophytic vegetation.

Figure B35 Physical Habitat Richness Metric – Slope with undercut banks. A slope (as on a stream bank or shoreline) with a portion of the soil that has broken away or has been excavated by water to form a hollow or void which provides habitat for fish or wildlife. Overhanging roots of trees are an example.

Figure B36 Physical Habitat Richness Metric – Rock piles with voids. A rock or a pile of rocks of sufficient size and with sufficient space underneath or in-between to provide shelter for fish or wildlife such as amphibians, reptiles, and small mammals. This is observed more frequently in the EMP ecoregion.

Figure B37 Physical Habitat Richness Metric – Plant hummocks/vegetated mounds. These structures provide habitat for wildlife, particularly small mammals, amphibians, reptiles, and insects. They are often most prominent in wetlands with low variation of the hydroperiod. The greater topographic complexity produces dynamic redox conditions due to the fluctuation of water tables in these structures. Consequently, they promote higher rates of biogeochemical cycling particularly those with readily available organic carbon.

Figure B38 Physical Habitat Richness Metric – Submerged/floating vegetation This includes true aquatic macrophytes that occur below or on the water surface and provide habitat for macro-invertebrates, fish, and other organisms.



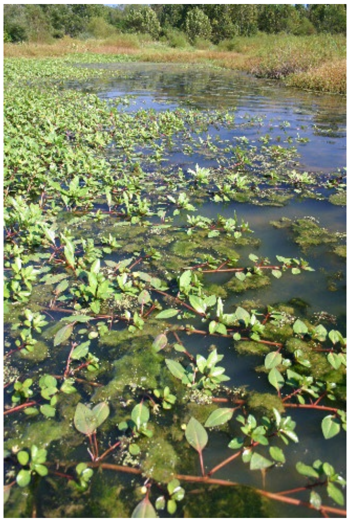


Figure B39 Physical Habitat Richness Metric – Dense herbaceous cover A layer of stems, leaves, and or litter of herbaceous plant species with sufficient density to create a canopy that shades the soil surface and serves as cover for wildlife.

Figure B40 Physical Habitat Richness Metric – Brambles/thickets. A dense clump, patch, or layer of the stems/branches of woody plants (e.g., vines, shrubs, and saplings) that provide cover for wildlife. Thickets surrounding open depressions are an example.

Figure B41 Physical Habitat Richness Metric – Mature/late successional stage of plant community. A community that has reached a state of maturity or equilibrium with natural environmental conditions and that provides unique and/or highly valuable habitat for wildlife (e.g., mature timber bottomland). Maturity or successional stage of a plant community is often determined by the amount of time since a disturbance or stress based on the species composition and/or age (e.g., trees >24” diameter breast height).

Figure B42 Physical Habitat Richness Metric – Drift deposits/organic debris/brush piles/fallen logs. The accumulation of woody and/or leafy debris, heaps of remanent vegetation, or dead tree trucks laying on the ground surface provides physical habitat for several levels of wildlife. However, excessive numbers often suggest other problems such as a drastic change in hydrology or pest infestations.

Figure B43 Physical Habitat Richness Metric – Standing snags/stumps. Any dead woody vegetation of significant size (>6" DBH) that remains standing and provides habitat for a variety of birds, small mammals, and insects.

Figure B44 Physical Habitat Richness Metric – Wind thrown trees. This includes trees uprooted and blown over by wind leaving pooled depressions and exposed roots for wildlife habitat as well as patches for plant regeneration and increased diversity.

Figure B45 Physical Habitat Richness Metric – Tree root cavities are located at the base of trees or within the root systems. Trees that are not completely wind thrown may produce cavities for wildlife cover.

Figure B46 Physical Habitat Richness Metric – Nesting cavities/dens. A hole or hollow tree that provides cover for birds and small mammals.

Figure B47 Plant Strata Metric. This forested wetland on the left in (Somerset County) has only two vegetative strata (herbaceous and tree stratum) with more than 5% total cover in the WAA. It would score a “2” for the plant strata metric. The forested wetland on the right on the right (Frederick County), has three strata and would score a “3” for this metric.

Figure B48 Plant Strata Metric. The forested pine flat wetland in Queen Annes County (left) has only a tree stratum with more than 5% total cover in the WAA. It would score a “1” for the plant strata metric. The forested wetland on the right on the right (Caroline County), has two strata (herbaceous and tree strata) and would score a “2” for plant strata. Both wetlands are in the CP ecoregion


Figure B49 Species Richness Metric. The photo on the left is a narrow slope wetland near Jug Bay which scores a "4" for this metric. Note the numerous different species in the foreground. Species richness scores are dependent upon wetland class and ecoregion. The wetland on the right is a riverine active floodplain wetland in Kent County. This wetland scored moderately for this metric. Both wetlands are in the CP ecoregion.


Figure B50 Species Richness Metric. Two examples of wetlands that score low for this metric. The photo on the left is a mineral flat wetland in Charles County (CP ecoregion) which is comprised of only a few woody species. The wetland on the left is an EMP depression wetland in Washington County dominated by only a few woody and herbaceous species. Both wetlands would score a "1" for this metric.


Figure B51 Non-Native/Invasive Species Metric. This slope wetland on the left is in the EMP ecoregion (Howard County) and is a near monoculture of reed canary grass (*Phalaris arundinacea*). This is a common scene in wetlands located on agricultural lands and would score a "0" for this metric. The photo on the right is another EMP ecoregion slope wetland (Carroll County) that has been invaded by a carpet of Japanese stilt grass (*Microstegium vimineum*). This wetland scores a "2" for this metric.


Figure B52 Interspersion Metric. Varying patches of plants or zones in wetlands which are often associated with minor elevation changes or gradients greater than six inches above the base or adjacent wetland elevations. The wetlands in both photos have a high degree of horizontal interspersion with vegetation patches intertwined and scattered throughout the WAA and would each score a “4” for interspersion.


Figure B53 Interspersion Metric. The wetland on the left has moderate interspersion and would score a “3” while the wetland on the right has no horizontal interspersion and scores a “1”.


Figure B54 Vegetation Alterations. Examples of recent vegetative alterations such as logging (left) where one or more of the plant strata have been removed or impacted and would score low/moderate for this metric. The abandoned pastureland on the right suggests some level of recovery and would score moderate.

Figure B55 Vegetation Alterations. Example of a Delmarva Bay (depression) wetland that was historically drained but is now exhibiting moderate level of recovery. While it is anticipated that this area will recover completely, its current condition is moderate and would score a “2” for this metric.

Figure B56 Vegetation Alterations. The wetland pasture on the left has both managed and unmanaged areas and potentially require two separate WAAs. However, both areas would score low for this metric due to the ongoing high intensity impacts. The wetland pasture on the right is also of high intensity and would score low due to the low potential for recovery.

Figure B57 Vegetation Alterations. Both back slope wetlands above are subject to infrequent mowing, often by opportunity which is typically in the dry season. The wet meadow on the left has a diverse herbaceous community indicating less frequent mowing which would result in a low to moderate score. However, the photo on the right is an example of wet hay land which is typically mowed (harvested) 1-2 times annually also resulting in much lower diversity of the plant community. This area would score low for this metric due to the higher intensity and lack of recovery. Utility lines, stormwater management basins, and hay land are additional examples of wetlands that would score low for this metric.


Figure B58 Vegetation Alterations. Utility line crossings are typically a permanent vegetative alteration. Regular maintenance prevents vegetative succession in most cases. The photo on the left is from the CP ecoregion and the photo on the right is in the EMP ecoregion. Regular maintenance of these utilities often involves mowing as well as the use of herbicides preventing forest succession resulting in low scores for this metric. Furthermore, the maintenance of these utility lines also reduces the scores for many of the biotic structure metrics such as species richness, plant strata, plant life forms and invasive species, which often invade the disturbance.


Figure B59 Vegetation Alterations. These slope wetlands in the EMP ecoregion were dominated by green ash (*Fraxinus pennsylvanica*) which has been devastated by the emerald ash borer permanently changing the structure and species composition of the vegetative communities. The increased light penetration has resulted in vigorous herbaceous and shrub growth. This situation commonly makes the wetland susceptible to invasion by invasive species as illustrated in the photo on the left which has an herbaceous layer now dominated by Japanese stilt grass (Microstegium vimineum). The photo on the right is now dominated by native stout wood reed (Cinna arundinacea) and lizards' tail (Saururus cernuum).

Figure B60 Plant Life Forms Metric. This metric evaluates the total number of different plant life forms. This often includes other groups of plants not typically recorded and quantified on delineation forms. However, groups like fungi and bryophytes add food and cover to various organisms in the wetland but must comprise at least 5% of the WAA.