ATTACHMENT II.A-2

Brevard County – Wetland Assessment Method

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Developed for Brevard County
By
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The intent is to develop a wetland assessment method used by Brevard County to identify "high-functioning" wetlands. The method evaluates three criteria to assess the functionality of a wetland system. The three criteria are: landscape location, water environment, and vegetative community.

1) Landscape Location:

Landscape location evaluates the surrounding landscape and the influences the landscape has on the wetland. The influences would include impacts or enhancement of water quality, wildlife utilization, and potential introduction of exotic species. A score is calculated by using a landscape support index (LSI). The LSI quantifies the proportions of different land uses within a 100m buffer around the wetland to be assessed. The percentage that a specific land use contributes to that buffer is multiplied by the established coefficient for that specific land use (Table 1 coefficient values range from 1 to 10). All of the values are summed and the value will range within 1 to 10.

Land Use	LSI Coefficient
Natural Community	10.00
Natural Open water	10.00
Pine Plantation	9.36
Recreational / Open Space (Low-intensity)	9.08
Woodland Pasture (with livestock)	8.87
Pasture (without livestock)	8.03
Low Intensity Pasture (with livestock)	7.32
Citrus	7.02
High Intensity Pasture (with livestock)	6.96
Row crops	6.07
Single Family Residential (Low-density)	3.57
Recreational / Open Space (High-intensity)	3.42
High Intensity Agriculture (Dairy farm)	3.33
Single Family Residential (Med-density)	2.81
Single Family Residential (High-density)	2.72
Mobile Home (Medium density)	2.56
Highway (2 lane)	2.43
Railroads	2.43
Low Intensity Commercial	2.22
Institutional	2.14
Highway (4 lane)	1.91
Mobile Home (High density)	1.90
Industrial	1.87
Multi-family Residential (Low rise)	1.49
High Intensity Commercial	0.91
Multi-family Residential (High rise)	0.90
Central Business District (Average 2 stories)	0.64
Central Business District (Average 4 stories)	0.00

Based on coefficients developed by Reiss and Brown, 2005 as described in Bardi et al., 2005

For example, an approximate 24 acre wetland that has a 100m buffer (39.6 acres) that includes 40% woodland pasture and 60% single family low-density residential would be 0.4 (percentage expressed as decimal) times the 8.87 (coefficient) plus 0.6 times the 3.57, respectively. The resulting LSI value is 5.69 (3.548 + 2.142).

The coefficients were proposed and developed by several authors including Bardi et al. 2005, Reiss and Brown 2005, Cohen et al. 2004, Lane et al. 2004, and Doherty et al. 1999. The coefficients were developed by evaluating the potential effects of adjacent land-use on wetland systems.

2) Water Environment:

The hydrologic functions of the wetland being assessed are evaluated for two criteria including water quality and hydrology (depth and duration of inundation). Water quality is assessed by evaluating the treatment that water inflows undergo prior to entering to the wetland. The hydrology is assessed by reviewing plant morphological characteristics and the plant community structure.

Water Quality Treatment Category Score

The water quality treatment is assessed utilizing criteria developed for Wetland Rapid Assessment Procedure (WRAP) analysis of wetlands (Miller and Gunsalus, 1999). The treatment is assessed based on the analysis of the contributing watershed lands surrounding the wetland and the water quality treatment that the lands provide. Treatment of stormwater pollution can be achieved by several methods. Wet detention can achieve up to 90 percent reduction for nutrients and solids. Treatment by dry retention is considered to be inferior to wet detention. If the treatment system present is not operational then the score should reflect the condition of the system.

Therefore, if the wetland being assessed is in a larger wetland system, then the water quality treatment category is natural. The analysis determines which type of water quality treatment, if any, is occurring. If a system is entirely cut-off from its natural contributing basin and is solely rainfall dependent, a standard score of 4.6 is entered.

Category	Coefficient
Natural undeveloped area	5.0
Only rainfall dependent – no contributing basin	4.6
Wet detention with swales	4.2
Wet detention with dry detention	4.2
Combination grass swales with dry detention	3.3
Grass swales only / vegetative buffer strip	1.7
Dry Detention only	1.7
No treatment	0

Coefficients were based on values developed and utilized by Miller and Gunsalus, 1999

The coefficient is multiplied by the percentage (expressed as decimal) that the surrounding area contributes to the treatment type. The different treatment types are then summed resulting in a value

between 0 and 5. For example a wetland buffer with 50% *natural*, 25% *wet detention with swales*, and 25% *dry detention only* (0.50 x 5.0 + 0.25 x 4.2 + 0.25 x 1.7=3.975) would result in a water quality treatment score of 3.975.

Hydrologic Indicators Score

The wetland is assessed based on evaluation of indicators of the hydrologic conditions present in the wetland which describe the hydrologic regime and the water environment. These scores result in values between 0 and 5.

Indicators	**Coefficient**
Hydrology severely altered with strong evidence of succession to transitional/upland or open water plant community • Hydrology severely modified • Hydroperiod will not support wetland plant species associated with the particular community type • Substantial evidence that upland plant species are encroaching into the wetland because of decreased hydroperiod • Wetland plants dying-off because of increased hydroperiod • Substantial soil subsidence of organic soil substrates	0
Hydrology inadequate to maintain a viable wetland system • Hydroperiod not adequate to maintain the type of wetland system that is being assessed • Appropriate vegetation stressed or dying from too much or too little water; encroachment of transitional/upland plant species into wetland • Evidence of soil subsidence of organic soil substrates	1.7
Hydrology adequate to maintain a viable wetland system, external features may affect wetland hydrology • Hydroperiod appears adequate, but adjacent features (canals, ditches, swales, berms, reduced drainage area, culverts, pumps, control elevations, or wellfields) are possibly influencing the hydroperiod of the wetland being assessed • Plants appear healthy, but some signs of improper hydrology are present • Little evidence of soil subsidence of organic soil substrates	3.3
Hydrology maintaining a viable, high functioning wetland system • Plants appear healthy, no signs of stress from improper hydrology are present • Wetland has natural hydroperiod • Not adjacent to features (canals, ditches, swales, berms, reduced drainage area, culverts, pumps, control elevations, or wellfields) that could negatively impact the wetland • No sign of soil subsidence of organic soil substrates	5.0

Coefficients were based on values developed and utilized by Miller and Gunsalus, 1999

Indicators of negative conditions would include would be shifts in vegetation from wetland species (Obligate and Facultative Wet) to more transitional (Facultative) species and Upland species. An additional negative indicator could be large amounts of soil subsidence. Die-offs of plant species due to inappropriate, increased inundation would also be a negative indicator.

Positive indicators could include, appropriate plant species composition, stain and lichen lines, moss collars, and appropriate adventitious rooting.

The Hydrologic Indicator Score is a value between 0 and 5.

The two water criteria values are summed and produce a total water environment score that ranges from 0 to 10. This represents the overall water environment score for the assessment wetland. If the example wetland had a hydrologic indicator score of 3.3, then the water environment score would be 7.275

3) Vegetative Community:

The Vegetative Community Score is developed by evaluating the species of vegetation present in the wetland being assessed. There are two scoring matrixes; one score evaluates the percentages of wetland vegetative species present and the other evaluates the percentages of exotic or invasive species present. The Vegetative Community Score is the average of the scores from the matrixes, unless 1) the wetland vegetation is less than 30 percent or 2) the percent of exotic vegetation is greater than the percent of wetland vegetation. If either of these two conditions exists the Vegetative Community Score will equal zero. For example, if the percentage of wetland vegetation is approximately 40% than Wetland Vegetation Score is 3 (see Table 1. Wetland Vegetation Score). If the wetland that you are scoring includes a small percentage (10%) of Brazilian pepper the Exotic Vegetation Score would be 8 (see Table 2. Exotic Vegetation Score). The Total Vegetative Community score would be (3+8)/2 or 5.5.

The rationale for the plant community scoring is derived from literature that indicates the plant community shifts in response to conditions in the wetland. Drier conditions will allow less wetland vegetation to be established in a wetland. The introduction of exotic species typically occurs in systems that are undergoing disturbance or stress (Zedler and Kercher, 2004). Additionally, a wetland may exist with a low level of exotics for many years. When the density of exotic species reaches a particular threshold, the exotic species out compete the native species and the community will undergo a shift to becoming an exotic monoculture. This shift is believed to occur when a system becomes approximately 30% exotic species. This value is supported by regulatory agencies since agencies will not give mitigation credit for exotic removal until a system includes approximately 30% exotic plant species.

Table 1. Wetland Vegetation Score

%	*score*
0	0
10	0
20	0
30	2
40	3
50	6
60	8
70	9
80	10
90	11
100	12

Table 2. Exotic Vegetation Score

%	*Score*
0	8
15	7
25	5
30	4
50	2
100	0

Table 3. Vegetation Score

Vegetation Criteria	*Percentages (from other tabs)*	*Score*		*Thresholds*
Wetland Vegetation	40	3		a perfect wetland would have a maximum score of 10
Exotic Vegetation	10	8		
Total Percentage	50	5.5	***Vegetative Community Score (average)***	The Vegetative Community Score is calculated as the average of the wetland vegetation score and the exotic vegetation score unless; 1) the wetland vegetation is < 30% or 2) if the percent of exotic vegetation is > the percent of wetland vegetation. If either of these two conditions exist the Community Vegetative Score will = 0.

Evaluation Score

Overall scores are summed and divided by thirty. The resulting calculation ranges from 0 to 1 and is the value that determines if the assessed system is considered a high functioning system. A pristine system free from any anthropomorphic effects would score 1 (30 divided by 30). The value of high functioning wetlands will be 0.70 or above. This value could also be interpreted that the system is operating at 70% of its functional potential.

The cut-off for defining a wetland system as "High-Functioning" was developed from analyzing more than thirty wetland systems throughout Brevard County. These systems varied in conditions and qualities. A wetland system must have a score of **0.70** or above to be considered "High-Functioning".

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