"METHOD FOR WETLAND FUNCTIONAL ASSESSMENT"

PHASE I

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Maryland Coastal Zone Management Program

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Field Analysis of the FHWA "Method for Wetland Functional Assessment" Phase I

Report

October 1987

COASTAL ZONE
INFORMATION CENTER

Submitted to:

Nontidal Wetlands Division
Maryland Water Resources Administration

by

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Abstract

The following report is an analysis of the nutrient and sediment portions of the U.S. Army Corps of Engineers Wetland Evaluation Technique (WET). It includes, in sentence form, all of the questions used in the nutrient and sediment portions of the technique. It also sets out, in sentence form, the keys used in rating individual wetlands using WET. WET was used in the field to assess a number of wetlands, and these wetlands are described, the outcome of their assessments given, and a discussion of the pathways that resulted in their particular ratings set forth.

Table of Contents

Page	Title
1	Questions used in the Sediment/toxicant retention and Nutrient removal/transformation keys (sentence form).
9	Response form for the keys.
13	Discussion of the keys.
16	Sediment/toxicant retention effectiveness key (sentence form).
24	Sediment/toxicant retention opportunity key (sentence form).
26	Nutrient removal/transformation effectiveness key (sentence form).
36	Nutrient removal/transformation opportunity key (sentence form).
38	Wetland Assessment using WET.
51	Copies of all keys (number form)

Questions Used in the Nutrient retention/transformation and Sediment/toxicant retention Keys

1.2 Is the rainfall erosivity factor (E130 in the Universal Soil Loss Equation) greater than 300 (this information is available from the local SCS office).

4.2 (C and D) The area of the AA's watershed (ignoring the 5 mile limitation imposed by WET's definition of watershed) in square miles is:

4.2C 100-2,500.
4.2D Greater than 2,500.

5.1.1 Does the area of the Wetland Depression comprise less than 5% of the area of it's watershed?

5.2 Do upslope Wetland Depressions comprise more than 5% of the total acreage of the watershed of this wetland depression?

7 Is the channel gradient of the Assessment Area less than the gradient shown in Table 3? Measure the AA's gradient using the finest scale topographic map available (See figure 12, page 53).

Table 3. Gradient necessary to create depositional velocity conditions (interpreted from SCS curves for channel flow).

M.Depth(ft)	N>0.1251 [a]	N=0.0802 [b]	N=0.0503 [c]	N<0.0354 [d]
<0.5	<0.0250	<0.0100	<0.0038	<0.0018
0.5-1	<0.0150	<0.0060	<0.0023	<0.0012
1-2	---	<0.0030	<0.0012	<0.0006
2-3	---	<0.0017	<0.0006	<0.0003
3-45	---	<0.0013	<0.0005	<0.0002
4-65	---	<0.0008	<0.0003	<0.0001
6-85	---	<0.0006	<0.0002	<0.0001
8-105	---	<0.0004	<0.002	---

N is the Manning roughness coefficient. They are described below.

a. Most densely wooded floodplains.
b. Most densely vegetated emergent wetlands not totally submerged by flood flows.
c. Most moderately vegetated or totally submerged (by flood waters) emergent wetlands, or with boulders.
d. Mostly unobstructed channels.

8.1 Does surface water enter the AA or connect it to other water bodies via a constricted or unconstricted permanent inlet?

8.3/8.4 Does surface water enter the Assessment Area or connect it to other water bodies via a constricted or unconstricted:*

8.3 Permanent outlet?
8.4 Intermittent Outlet?

*If this is a fringe wetland (See figures 3b and 3c, p.20), answer "Y" to both inlet and outlet. Some contiguous oxbows will be classified intermittent. Do not consider precipitation or overland sheet flow to be surface water.

9.1 (Answer this question only if flow is present at least intermittently in the AA). Is the total width of the Assessment Area's outlet(s), at high flow, less than one-third the average width of the AA measured perpendicular to flow (or one-tenth if no gradient or tidal flow is present), or is the cross-sectional area of the outlet(s) clearly less than that of the inlet(s), thus causing "ponding" (see figure 13, page 54).

9.2 Does floodwater from an adjoining body of water enter the AA as sheetflow (e.g., as when a river or lake overtops a levee over a wide area) and exit the AA through constricted outlets or not at all (see figure 14, page 54).

10C According to the FWS wetland classification system, is the wetland system dominant in the Assessment Area Riverine Nontidal?

12 Select the one class and subclass of vegetation that is dominant* in Assessment Area. Now, select the one class and subclass (if different from above) that is dominant at the edge of open water in Zones B or C (see figure 15, p.56) excluding areas of submerged vegetation in Zone B (sB). Now, select the one class and subclass (if different from above) that have root and lower stem contact with water over the largest area of the AA's wetland. Specifically, is the AA:

12 A/B/Cb/Da. Forested (A) or Scrub/shrub (B) or Aquatic bed (and floating vascular) (Cb) or Emergent (and persistent) (Da)?

12 Aa/Ba. Forested (and dead) (Aa) or Scrub/shrub (and dead) (Ba)?

12 E. Moss-lichen?

*"Dominant" is the class and subclass with the largest percentage of cover. However, if 12.A-forested and 12.B-scrub/shrub together, or 12.C-aquatic bed and 12.D-emergent together comprise a greater percentage of cover than any other class, answer "YES" to the larger of the two classes. You may also use this

procedure on a subclass level by grouping evergreens (all 4), deciduous (all 4), dead (both). For example, if the four evergreen subclasses together comprise a greater percentage of cover than any single subclass, answer YES to the largest of the four subclasses.

13 Do any of the categories of forested (A), Scrub/shrub (B), or Persistent emergent (Da) comprise at least 1 acre or 10% of the Assessment Area?

A = forested
B = scrub/shrub
Da = persistent emergent

15.2 Within most of the Assessment Area having measurable flow, is either of the following conditions present?

a) Vegetation in Zone B consists mainly of robust emergents distributed in the mosaic pattern described in 15.1C (a mosaic pattern with relatively small areas of vegetation (none smaller in diameter than two times the height of the prevailing vegetation) highly interspersed with numerous pools, channels, or flats (see figure 16b, p. 57).

b) Flow enters the Assessment Area in a channel and then spreads out over a wide area.

17 Are any of the following statements true?*

a) The AA is 1-10 acres and has 3 or more vegetation classes and/or 4 or more subclasses.

b) The AA is 10-100 acres and has 3 or more vegetation classes and/or 6 or more subclasses.

c) The AA is 100 or more acres and has 4 or more classes and/or 8 or more subclasses.

*No class may comprise more than 70% of the AA or less than 100 ft2.

19.1A Is the vegetation or topographic relief adjacent to the Assessment Area sufficient ("sufficient" is defined as"if the height of vegetation or relief times length (parallel to shore) is greater than 2000 ft2) to shelter at least 1 acre of open water in zones B or C from wind, or is fetch less than 100 feet (see figure 19, p. 60).

19.1B Is the vegetation or topographic relief adjacent to the AA not sufficient ("sufficient" is defined as"if the height of vegetation or relief times length (parallel to shore) is greater than 2000 ft2) to shelter at least 1 acre of open water in Zones B or C from wind, and is fetch greater than 2 miles, or are the deeper edges of emergent vegetation in Zone B exposed to waves taller than 1 ft?

19.2 (For lacustrine wetlands only. If not lacustrine, answer "I") Does the Assessment Area, or part of the AA, comprise all of an island, delta, bar, or peninsula that intercepts waves so as to protect other nearby shores (figure 20, p. 60).

21A Is the dominant ("dominant" means the greatest percentage of total land cover) land cover of the watershed forest and scrub?

22.2 Does the Assessment Area include, or is it part of, an actively accreting delta (figure 23, p. 62).

22.3 Do aerial photos indicate long-term erosion of the Assessment Area?

23 Do functioning ditches, canals, levees, or similar artificial features (excluding those built specifically for wildlife management) within the AA, or at its inlet or outlet, confine surface water to a narrower part of the AA than it would without such features?

24.1 (Answer "U" is unknown) Are the soil types present in the Assessment Area known to contain more than 4,000 mg/kg (dry weight) of amorphous aluminum in the upper 8 inches?

24.2 (answer only if no data are available for question 24.1). Is either of the following conditions present?

1) Soil maps indicate presence of alluvial (e.g., fluvaquent), ferric, clay, or other primarily fine mineral soils in the AA.

2) The map in Figure 24 (page 63) shows the soils of this region to normally have elevated concentrations of aluminum (>6%) or iron, and analysis indicates there is less than 20% organic matter by weight in the upper 3 inches of sediment.

25.1 Is there any feature that is a source, or potential source, of inorganic sediment to the Assessment Area? Consider stormwater outfalls, irrigation return waters, surface mines, or areas (those areas comprising 1 acre or 2% of the buffer zone or an area within 0.5 miles at least as large as the AA's wetland acreage) containing any of the following: exposed soils associated with agriculture, lands cleared within the last 2 years, soil-slope conditions classified by SCS as eroding or erosion hazard (e.g., subclass "e" in the SCS Land Classification Codes), gullies, sand or gravel pits, or severely eroding stream or road banks.

25.2A Is the primary sediment source entering the AA sheetflow?

25.2B Is the primary sediment source entering the AA channel flow.?

25.3 Are any of the following true?

a) Erosion is caused by drastic fluctuation in water levels due to artificial manipulation or extensive urban runoff.

b) Slopes immediately adjacent to the wetland are steeper than 10% (or steeper than 1% if alluvial clays prevail) and are unstable.

c) Boating causes frequent wakes that impinge on the deepwater fringe of the AA.

d) Tributaries immediately upstream of the AA have been channelized.

26.1 Are any of the following a source, or a potential source, of nutrients to the Assessment Area?

a) Sewage outfall, phosphate mines, tile drains, canals and other nutrient rich sources.

b) Areas containing any of the following: feedlots, active pasture land, landfills, septic fields, fertilized soils, soils tilled, burned, or cleared within the last 2 years.

c) Actual observances of nuisance algal blooms or measurement of excessive nutrient concentrations.

d) Areas where the acreage of the WD divided by the number of houses with septic systems within the buffer zone is less than 8.

e) Areas where the acreage of the WD divided by the number of people within the buffer zone (including those beyond the buffer zone if their wastes are carried to the buffer zone, or AA, by a collector-outfall system) is less than 25.

26.2 (If 26.1 is "No" circle "I" for 26.2) Is overland sheet flow the primary source of nutrients entering the AA?

26.3 (If 26.1 is "N", circle "I" for 26.3) Is channel flow the primary source of nutrients entering the AA?

27.1 Is there any feature that is a source, or a potential source, of waterborne toxic substances (hazardous to aquatic life at typical exposure levels) to the AA? Consider industrial and sewage outfalls, mines, landfills, leaking subsurface tanks, salt/brine seepage, pesticide-treated areas, contaminated aquifers, severe oil runoff, irrigation return water, heavily traveled highways, or water inputs significantly contaminated by the above farther upstream. Also, consider observed fish kills and actual measurement of hazardous levels.

28 Is either of the following conditions true?

a) Most of the Assessment Area has been tilled, filled, or excavated at least once in the past 3 years.

b) An outlet has recently been added to the AA's wet depression where none previously existed, OR an inlet has recently been blocked off and an outlet is still present.

31.1 Considering the entire Assessment Area, are Zones A and B together greater than zone C?

31.4 Is the area of submerged vegetation in Zone B larger than the open water area of Zones B and C (answer "I" if the submerged vegetation zone is absent).

31.6A Do the combined percentages of those areas in zones B and C containing emergent vegetation (answer YES if zone B is missing) equal 0?

33 A/E/J/K. Do any of the hydroperiods listed below best describe the portion of the AA, or the contiguous, accessible deeper waters, that are inundated or saturated for the longest part of the year, and comprises at least 1 acre of 10% of the AA.

33A. Permanently flooded non-tidal
33E. Saturated (no standing water) non-tidal.
33J. Irregularly exposed tidal.
33K. Irregularly flooded tidal.

34.2. Is the Assessment Area located less than 2 miles downslope from a large impoundment (deeper than 20 feet at the outlet), or is the AA's water table demonstrably influenced by any other type of upstream impoundment?

34.3.1 Is any part of the Assessment Area flooded (even seasonally) due to permanent or temporary ponding created by a dam or dike?

35.1 Does flooding cause Zone B to expand more than 3 times (200%) its normal size for more than 25 days (figure 26), or is the relationship between extent and duration above the curve in Figure 27 (p.70) (Sources of initial information include gauging stations, direct observations, air photos, HUD/FEMA flood maps, local knowledge, flood models of the Hydrologic Engineering Center and SCS (e.g., HEC and TR-20. Other clues of flooding extent are water marks, drift lines, scour marks, absence of litter, beaver sign, sediment on leaves and stems, presence of flood intolerant vegetation (See Teskey and Hinckley 1977a,b,c, 1978a,b,c; and Walters, Teskey, and Hinckley 1980a,b. If clues are still insufficient, answer questions 35.1 "YES" if the wetland is low in the watershed AND has a large Zone A which is devoid of upland plants. Answer "N" if the wetland's Zone B shows a sharp transition to upland.

35.2 Are any of the following conditions true (if flowing water is absent answer "I").

a) Base flow typically fills less than 60% of the channel volume.

b) Surface water is absent 5 days after a mean monthly 24 hour storm, and the watershed is larger than 10 square miles (100 square miles in dry regions).

c) The ratio of the high flow (measured in cubic feet per second) that is reached or exceeded 10% of the year, versus the typical low flow that is exceeded 90% of the year, is greater than 1.5% (this analysis requires at least 2 years of daily streamflow records, and a summarization of these according to the "% exceedance" parameter. Such curves or data may be available for some streams with dams.

36.1 Is the average width (average width is measured along a line roughly perpendicular to flow, drawn from the upland edge to the deep water. If average width cannot be determined using this method, calculate average width by dividing the area of erect vegetation i Zones A and B by twice its length parallel to open water (or, if no open water, by its maximum dimension))of the area in Zone A and B that supports erect (eB) or robust (rB) vegetation:

36.1.1) less than 20 feet?

36.1.2) Greater than 500 feet, or the wet depression is constricted and erect vegetation (eB) is present throughout?

36.2 Is the average width of the area in Zone B that supports erect (eB) or robust (rB) vegetation and where depth seldom exceeds 50% plant height:

36.2.1 Less than 20 feet?
36.2.3 Greater than 500 ft, or alternatively, the WD is constricted, emergent vegetation is present throughout, and stem density is approximately 50 stems per meter or greater?

41.1 During annual peak flow is velocity throughout most of the Assessment Area less than 0.3 ft/sec, or if unknown, is most of the AA flooded for less than 5 days annually?

41.2 During annual peak flow is velocity throughout most of the Assessment Area greater than 1.5 ft/sec or greater than 3.3 ft/sec AND substrate is cobble-gravel.

42.1.1 Does 0 to 1 ft/sec describe the velocity category that reflects seasonal (wet and dry) flow velocities occurring in at least one acre or 10% of the Assessment Area?

43 Are any of these water depths dominant in the Assessment Area ("dominant" means greatest % of total area; Great precision

is needed only if the fish habitat function is being analyzed at the species level. Normally an estimate will suffice)

A - Less than 1 inch
B - 1 to 4 inches
C - 5 to 8 inches
D - 9 to 20 inches
E - 21 to 39 inches

45 Is the dominant surface sediment type (upper 3 inches) in most of the Assessment Area:

E. Cobble-gravel

F. Rubble

G. Bedrock

48B. Is the Assessment Area's salinity/halinity or conductivity less than (salinity) 0.5 to 5.0; (conductivity) 800 to 8000?

49.1.1 (Answer this question only if a nontidal channel with a gradient of less than 0.01 is present) Does the AA include, or is it included in, a permanently flooded stream reach of which 20% to 80% is pools or similar slow-water areas (backwater-type areas with flow velocity less than 0.6 ft/sec.

49.1.2 (Answer this question only if a nontidal channel with a gradient of less than 0.01 is present) Is the Assessment Area interspersed with riffles (naturally shallow areas with coarser substrate, generally cobble/gravel, and faster current) spaced at intervals of five to seven times the average stream width, and the substrate is cobble-gravel (answer "NO" if 49.1.1 equals YES).

55.1 Does most runoff or surface water entering the Assessment Area have a concentration of suspended solids (preferably inorganic) almost always below 25 mg/l, or/or a secchi disc reading consistently greater than 8 m (26.4 ft)?

56.1 Is alkalinity ($CaCO_3$) less than 20 mg/l? (Answer "I" to 56.1 if the AA is not accessible to fish).

64 (If Assessment Area lacks a constricted outlet or inlet, answer "I"). Are levels of total suspended inorganic solids, measured at the AA's inlet (especially during intense storms), greater than those measured simultaneously at the outlet, or is detention time (as determined by tracer dyes or morphometric measurements) at least 3 days in summer and 15 days in winter?

Response Form
For the Nutrient Removal/Transformation
and Sediment/Toxicant Keys

Question #	X	W	D
1.2	Y N		
4.2C	Y N I		
4.2D	Y N I		
5.1.1		Y N	
5.2		Y N	
7	Y N		
8.1	Y N		
8.3	Y N		
8.4	Y N		
9.1		Y N I	
9.2		Y N I	
10C	Y N	Y N	Y N
12A	Y N	Y N	Y N
12B	Y N	Y N	Y N
12Cb	Y N	Y N	Y N
12Da	Y N	Y N	Y N
12Aa	Y N	Y N	Y N
12Ba	Y N	Y N	Y N
12E	Y N	Y N	Y N
13A	Y N	Y N	Y N
13B	Y N	Y N	Y N
13Da	Y N	Y N	Y N
15.2	Y N I		

(Page 2) Sediment and Nutrient Answer Sheet

Question #	X	W	D
17	Y N		
19.1A	Y N		
19.1B	Y N		
19.2	Y N I		
21A	Y N		
22.2	Y N		
22.3	Y N		
23	Y N		
24.1	Y N U		
24.2	Y N I		
25.1	Y N		
25.2A	Y N		
25.2B	Y N		
25.3	Y N		
26.1	Y N		
26.2	Y N I		
26.3	Y N I		
27.1	Y N		
28	Y N		
31.1	Y N	Y N	Y N
31.4	Y N I	Y N I	Y N I
31.6A	Y N	Y N	Y N
31.6E	Y N	Y N	Y N
33A	Y N		
33E	Y N		

(Page 3) Sediment and Nutrient Answer Sheet

Question #	X	W	D
33J	Y N		
33K	Y N		
34.2	Y N		
34.3.1	Y N		
35.1	Y N I		
35.2	Y N I		
36.1.1	Y N	Y N	Y N
36.1.2	Y N	Y N	Y N
36.2.1	Y N	Y N	Y N
36.2.3	Y N	Y N	Y N
41.1		Y N I	
41.2		Y N I	
42.1.1	Y N	Y N	Y N
43A	Y N	Y N	Y N
43B	Y N	Y N	Y N
43C	Y N	Y N	Y N
43D	Y N	Y N	Y N
43E	Y N	Y N	Y N
45E	Y N	Y N	Y N
45F	Y N	Y N	Y N
45G	Y N	Y N	Y N
48B	Y N	Y N	Y N
49.1.1	Y N I	Y N I	Y N I
49.1.2	Y N I	Y N I	Y N I

(Page 4) Sediment and Nutrient Answer Sheet

Question #	X	W	D
55.1	Y N U		
56.1	Y N I U		
64		Y N I U	

Discussion of the Sediment/Toxicant Retention and the Nutrient Removal/Transformation Keys

A. Sediment/Toxicant Retention Effectiveness Key

There are three wetland characteristics that will immediately result in a high rating in this key, in the first "box" of the key. They include a sheet flow inlet and a constricted outlet (#9.2), the absence of an outlet (8.3/8.4), or a wetland with a zone of "erect" (persistent) vegetation greater than 500 feet or covering the entire wetland. This last characteristic cannot be met by a completely forested wetland if "erect" vegetation is defined as herbaceous only. The first two questions need to be examined further, preferably in the field, since it is difficult to describe the outfall of a floodplain forest without seeing the pattern of runoff. It appears that a more detailed question might be needed to differentiate floodplain forests in Maryland. In the present assessment, it has been assumed that a "constricted outlet" includes a contiguous, downstream road berm with a bridge over the associated stream. This berm acts to constrict the outflow of water. However, there may be more subtle types of constricted outlets.

In the second box of the key, there are a number of questions asked that, if true, result in a low rating for the wetland. Two of the most critical for forested wetlands include water depth and the presence of emergent vegetation. Question 43 requires that the water depth in the wetland be deeper than 39 inches to avoid a low rating for that function. In addition, question 31.6 requires that some emergent vegetation be present for the wetland to avoid a low rating. Both of these characteristics are unusual for for small, forested floodplain wetlands in Maryland and in that sense are not particularly useful for differentiating these wetland types. In addition, the way the key is currently arranged, there is a high probability that the wetland will receive a low rating.

The third box in the key is the last place that the wetland can receive a high rating. Since one of the three questions here involves the presence of emergent vegetation, there are two questions here which can result in a high rating. The critical question here is the presence of a dike or dam downslope which creates flooding. As in question 9.2, above, I have assumed for the present assessment that this includes a downstream road berm and bridge above the associated stream. If the wetland has such a dike or dam, it receives a high rating. If not, the assessment continues.

The assessment lead to either List A or List B. It is very difficult for a forested wetland to get a moderate rating after this point in the key. As currently set up, the wetland must have

some emergent vegetation (#36), have a constricted outlet (9.1), or be some type of wetland other than palustrine. There are several inconsistancies in Lists A and B. Question 9.2 is found in both lists, but if this question is answer "yes", the wetland would have already received a high rating at the beginning of the key.

B. Sediment/Toxicant Retention Opportunity Key

This key is rather straightforward and seems not to have any built-in bias against small, forested wetlands. In order to receive a high rating, there must be some observable source of sediment in the watershed, either real or potential. If this is not the case, the assessment continues. One critical point for forested wetlands is the requirement that there be a permanent inlet present in the wetland. Since most of the floodplain forests in Maryland are intermittently flooded, most cannot meet this requirement, so are rated low. However, this portion of the key comes after List A, containing three questions that must be true for the wetland in order for the wetland to be rated moderate. These questions include the presence of a watershed that is not forest or scrub/shrub, a wetland area that is less than 5% of the it's watershed area, and a watershed in which other wetlands comprise less than 5% of the total watershed area. These appear to be useful questions.

C. Nutrient Removal/Transformation Effectiveness Key

Two of the three questions that begin the sediment/toxicant key also begin this key. They include a requirement for a surface flow input and a constricted outlet (9.2), or the complete absence of an outlet (8.3,8.4). Like the sediment/toxicant key, if either of these two questions are true for the wetland, it is rated high for the function.

In the second box of the key are questions that, if true for the wetland, result in a low rating. The velocity of the water moving through the wetland is the most critical question here. However, List A contains the most detailed questions about the wetland and can result in a high rating for the wetland. List A contains three questions that are very difficult for a small, forested wetland to get through without receiving a low rating. These questions include the presence of at least three vegetation classes (17), the presence of emergent vegetation (36.1.2/36.2.3), and a dominant hydroperiod that can be defined as permanently flooded or saturated. These three characteristics are rarely found in small, forested wetlands in Maryland.

D. Nutrient Removal/Transformation Opportunity Key

This key is very similar to the sediment/toxicant opportunity key, in that for a high rating to be immediately received by the wetland, a source of nutrients must be present in the watershed. If there are no such sources, the wetland will

receive a moderate rating if the watershed is not forest or scrub/shrub (21A), the wetland comprises less than 5% of the area of it's watershed (5.1.1), and upslope wetlands comprise less than 5% of the watershed area (5.2). After this part of the key, the wetland must possess a permanent inlet in order to receive a moderate rating, which results in most small, forested wetlands receiving a low rating.

Sediment/Toxicant Retention Effectiveness Key

The answers to these questions are to be listed in the x column of the answer sheed (max standing crop, or average conditions of wetness).

If any of the following are true, then the wetlands ranks as having HIGH potential for this function:

1) 9.2 YES. Does floodwater from an adjoining body of water enter the Assessment Area as sheetflow (e.g. as when a river or lake overtops a levee over a wide area) and exit the Assessment Area through constricted outlets or not at all (figure 14, page 54).

2) 8.3 NO, 8.4 NO. Does surface water enter the Assessment Area or connect it to other water bodies via a constricted or unconstricted:*

8.3 Permanent outlet
8.4 Intermittent Outlet

*If this is a fringe wetland (wetland width is not more than 3x the width of the channel) answer YES to both inlet and outlet questions. Do not consider precipitation or overland sheet flow to be surface water. (CA Note: This seems to indicate that forested wetlands along streams that are more than 3x the width of the stream would automatically be answered NO here, since most of them do not have permanent outlets and they usually just receive sheet flow).

3) 22.3 NO and 36.1.2 YES

22.3 NO. Do aerial photos indicate long-term erosion of the Assessment Area?

36.1.2 YES. Is the average width of the area in Zone A and B that supports erect (eB) or robust (rB) vegetation: 36.1.2 YES. Greater than 500 feet, or the wet depression is constricted and erect vegetation (eB) is present throughout.

If ANY of the above are true, the wetland is rated HIGH.
If NONE of the above are true, answer the following questions.

If ANY of the following are true, the wetland is rated LOW.

1) 19.1A=NO + 43A/B/C/D/E=YES + 31.4=NO + 31.6E=YES

19.1A NO. Is the vegetation or topographic relief adjacent to the Assessment Area sufficient to shelter at least 1 acre of open water in zones B or C from wind, or is fetch less than 100 feet (figure 19 on page 60).

43 YES. Which water depth category is dominant in the Assessment Area?
A - Less than 1 inch
B - 1 to 4 inches
C - 5 to 8 inches
D - 9 to 20 inches
E - 21 to 39 inches

31.4 NO. Is the area of submerged vegetation in Zone B larger than the open water area of zones B and C (answer I if submerged vegetation is absent).

31.6E YES. 100 percent of zone B and C taken together contains emergent vegetation (also answer YES if zone B is missing)

2) 19.1B YES. Is the vegetation or topographic relief adjacent to the AA not sufficient to shelter at least 1 acre of open water in Zones B or C from wind, and is fetch greater than 2 miles, or the deeper edges of emergent vegetation in zone B exposed to waves taller than 1 foot?

3) 64 NO. (If Assessment Area lacks a constricted outlet or inlet, answer "I"). Are levels of total suspended inorganic solids, measured at the AA's inlet (especially during intense storms), greater than those measured simultaneously at the outlet, or is detention time (as determined by tracer dyes or morphometric measurements) at least 3 days in summer and 15 days in winter?

4) 28 YES Is either of the following conditions true?

a) Most of the Assessment Area has been tilled, filled, or excavated at least once in the past 3 years.

b) An outlet has recently been added to the Assessment Areas wet depression where none previously existed, or an inlet has recently been blocked off and an outlet is still present.

5) 7.2 YES or 41.2 YES (41.2 may not have to be answered if question 7 is answered. See below).

CA NOTE: Question 7 does not have parts 1 and 2 as indicated in the key. It is a single part question concerning gradient. In this project, for the time being, it will be assumed that the question is written wrong, since if this question is true the

wetland is rated LOW. Thus the questin should really be "is the channel gradient of the AA GREATER than the gradient shown in Table 3"? This should be 7.2. Question 7.1 should be "less than", the way the question is currently written.

7.1 YES. Is the channel gradient of the Assessment Area greater than the gradient shown in Table 3? Measure the AA's gradient using the finest scale topographic map available (figure 12, page 53).

Table 3. Gradinet necessary to create depositional velocity conditions (interpreted from SCS curves for channel flow).

M.Depth(ft)	a N>0.1251	b N=0.0802	c N=0.0503	d N<0.0354
<0.5	<0.0250	<0.0100	<0.0038	<0.0018
0.5-1	<0.0150	<0.0060	<0.0023	<0.0012
1-2	---	<0.0030	<0.0012	<0.0006
2-3	---	<0.0017	<0.0006	<0.0003
3-45	---	<0.0013	<0.0005	<0.0002
4-65	---	<0.0008	<0.0003	<0.0001
6-85	---	<0.0006	<0.0002	<0.0001
8-105	---	<0.0004	<0.002	---

N is the Manning roughness coefficient. They are described below.

a. Most densely wooded floodplains.
b. Most densely vegetated emergent wetlands not totally submerged by flood flows.
c. Most moderately vegetated or totally submerged (by flood waters) emergent wetlands, or with boulders.
d. Mostly unobstructed channels.

41.2 YES. During annual peak flow is velocity throughout most of the Assessment Area greater than 1.5 ft/sec or greater than 3.3 ft/sec And substrate is cobble-gravel.

If any of the above questions were answered TRUE, the wetland is rated as LOW for this function.

If NONE of the above questions were answered TRUE, go on to the following questions.

If any part of the question below is TRUE, and either one of questions 1 or 2 are TRUE, the wetland is rated high for this function.

7.1 YES or 41.1 YES or 42.1.1 YES

7.1 YES. Is the channel gradient of the Assessment Area less

than the gradient shown in Table 3?

41.1 YES. During annual peak flow is velocity throughout most of the Assessment Area less than 0.3 ft/sec, or if unknown, is most of the AA flooded for less than 5 days annually?

42.1.1 YES. Answer "Y" to the velocity categories that reflect seasonal (wet and dry) flow velocities occurring in at least one acre or 10% of the Assessment Area. 42.1.1 = 0 to 1 ft/sec.

AND, any of the following:

1) 34.3.1 YES. Is any part of the Assessment Area flooded (even seasonally) due to permanent or temporary ponding created by a dam or dike?

2) 22.3 NO + 31.6A NO + 12A/B/Da YES + (22.2 YES or 19.2 YES)

22.3 NO. Do aerial photos indicate long-term erosion of the Assessment Area?

31.6A NO. What percent of Zone B and C taken together contains emergent vegetation? 31.6A = 0.

12A/B/Da YES. Select the one class and subclass of vegetation that is dominant in the Assessment Area. Now, select the one class and subclass (if different from above) that is dominant at the edge of open water in Zone B. Now, select the one class and subclass (if different from above) that have root and lower stem contact with water over the largest area of the AA's wetland.

12A = forested
12B = scrub-shrub
12Da = emergent & persistent

22.2 YES or 19.2 YES.

22.2 YES. Does the Assessment Area include, or is it part of, an actively accreting delta (figure 23, page 62).

or

19.2 YES. Does the Assessment Area, or part of the AA, comprise all of an island, delta, bar, or peninsula that intercepts waves soas to protect other nearby shores (figure 20, page 60). NOTE: answer "I" if none of the AA is lacustrine, estuarine, or marine.

If any part of the first question in this block of questions, and either question 1 or 2 are TRUE, this wetland is rated HIGH for this function.
If not, go to the next block of questions.

If BOTH of the following questions are TRUE, go to (question) List A.

If NOT, go to List B.

1) 7.1 YES or 41.1 YES or 31.1 NO

7.1 YES. Is the channel gradient of the Assessment Area less than the gradient shown in Table 3? (CA NOTE: see discussion of this question above).

41.1 YES. During annual peak flow is velocity throughout most of the Assessment Area less than 0.3 ft/sec, or if unknown, is most of the AA flooded for less than 5 days annually?

31.1 NO. Considering the entire Assessment Area, are Zones A and B together greater than zone C?

If BOTH of the above are TRUE, go to List A. If NOT, go to List B.

LIST A.

If BOTH of the following two questions are TRUE, the wetland is rated MODERATE for the function.
or,
If ALL of the 3 questions following the above are TRUE, the wetland is rated MODERATE for the function.

If NOT, go to LIST B.

1) 13A/B/Da YES. Which of the above classes and subclasses listed in question 12 comprise at least 1 acre, or 10% of the Assessment Area?
A = forested
B = scrub/shrub
Da = persistent emergent

2) (36.1.1 NO + 25.2A YES) OR (36.2.1 NO + 25.2B YES + 7.1 YES + 9.1/9.2 YES)

36.1.1 NO + 25.2A YES

36.1.1 NO. Is the average width of the area in Zone A and B that supports erect or robust vegetation less than 20 feet?

25.2A YES. Is the primary sediment source entering the Assessment Area sheetflow?

OR

36.2.1 NO + 25.2B YES + 7.1 YES +
9.1/9.2 YES.

36.2.1. NO. Is the average width of the area in Zone B that supports erect or robust vegetation and where depth seldom

exceeds 50% plant height less than 20 feet?

25.2B YES. Is the primary sediment source entering the Assessment Area channel flow?

7.1 YES. Is the channel gradient of the Assessment Area less than the gradient shown in Table 3?

9.1/9.2 YES.

9.1 YES. Is the total width of the Assessment Area's outlet(s), at high flow, less than one-third the average width of the AA measured perpendicular to flow (or one-tenth if no gradient or tidal flow is present), or is the cross-sectional area of the outlet(s) clearly less than that of the inlet(s), thus causing "ponding" (see figure 13, page 54).

9.2 YES. Does floodwater from an adjoining body of water enter the AA as sheetflow (e.g., as when a river or lake overtops a levee over a wide area) and exit the AA through constricted outlets or not at all (see figure 14, page 54).

If BOTH of the first two questions above were TRUE, the wetland is rated MODERATE for the function.
or,
If ALL of the 3 questions following the first two questions were TRUE, the wetland is rated MODERATE for the function.

If NOT, go to LIST B.

List B.

If ALL of the first three questions below are answered TRUE, the wetland is rated MODERATE for the function.
OR
If ALL of the second set of three questions below are answered TRUE, the wetland is rated MODERATE for the function.

Otherwise, the wetland is rated LOW for the function.

1) 31.4 YES. Is the area of submerged vegetation in Zone B larger than the open water area of Zones B and C (answer "I" if the submerged vegetation zone is absent).

First Set:

2) 10D/E/F YES. According to the FWS wetland classification system, what wetland system is dominant in the Assessment Area?
D = Riverine tidal (no woody or persistent vegetation)
E = Estuarine
F = Marine (no erect vegetation)

3) Is the Assessment Area's salinity/halinity or conductivity less than (salinity) 0.5 to 5.0; (conductivity) 800 to 8000 (CA NOTE: oligohaline to completely fresh).

Second Set:

1) 10C/D YES. According to the FWS wetland classification system, what wetland system is dominant in the Assessment Area?
C = Riverine nontidal
D = Riverine tidal

2) 35.1 YES or 35.2 YES.

35.1 YES. Does flooding cause Zone B to expand more than 3 times (200%) its normal size for more than 25 days (figure 26), or is the relationship between extent and duration above the curve in Figure 27?
OR
35.2 YES. Are any of the following conditions true (if flowing water is absent answer "I").

a) Base flow typically fills less than 60% of the channel volume.
b) Surface water is absent 5 days after a mean monthly 24-hour storm, and the watershed is larger than 10 square miles (100 square miles in dry regions).
C) The ratio of the high flow (measured in cubic feet per second) that is reached or exceeded 10% of the year, versus the typical low flow that is exceeded 90% of the year, is greater than 1.5 (i.e., is the watershed flashy?). (This analysis requires at least two complete years of daily streamflow records, and a summarization of these according to the "percent exceedance" parameter. Such curves or data may be available for some streams with dams.

3) 15.2 YES or 31.4 YES.

15.2 YES. Within most of the Assessment Area having measurable flow, is either of the following conditions present?

a) Vegetation in Zone B consists mainly of robust emergents distributed in the mosaic pattern described in 15.1C.
b) Flow enters the Assessment Area in a channel and then spreads out over a wide area.

OR

31.4 YES. Is the area of submerged vegetation in Zone B larger than the open water area of Zones B and C (answer "I" if the submerged vegetation zone is absent).

4) 9.1 YES or 9.2 YES or 31.1 YES or (49.1.2 YES + 49.1.1 YES).

9.1 YES. Is the total width of the Assessment Area's outlet(s),

at high flow, less than one-third the average width of the AA measured perpendicular to flow (or one-tenth if no gradient or tidal flow is present), or is the cross-sectional area of the outlet(s) clearly less than that of the inlet(s), thus causing "ponding" (see figure 13, page 54).

or

9.2 YES. Does floodwater from an adjoining body of water enter the AA as sheetflow (e.g., as when a river or lake overtops a levee over a wide area) and exit the AA through constricted outlets or not at all (see figure 14, page 54).

or

31.1 YES. Are Zones A and B together greater than Zone C?

or
49.1.2 YES + 49.1.1 YES.

49.1.2 YES. Is the Assessment Area interspersed with riffles (naturally shallow areas with coarser substrate, generally cobble/gravel, and faster current) spaced at intervals of five to seven times the average stream width, and the substrate is cobble-gravel (answer "NO" if 49.1.1 equals YES). (CA NOTE: Conflicting instructions about this question).

49.1.1 YES. Does the AA include, or is it included in, a permanently flooded stream reach of which 20% to 80% is pools or similar slow-water areas (backwater-type areas with flow velocity less than 0.6 ft/sec.
If ALL of the first three questions above were answered TRUE, the wetland is rated MODERATE for the function.
OR
If ALL of the second set of three questions above were answered TRUE, the wetland is rated MODERATE for the function.

Otherwise, the wetland is rated LOW for the function.

Sediment/toxicant Retention Opportunity Key

The answers to these questions are to be listed in the "X" column of the answer sheet (form B) (maximum standing crop, or average conditions of wetness). If these are not available, use the answers in the "W" column, or as a last resort the answers in the "D" column.

If any of the following four questions are answered TRUE, then the wetland ranks as having HIGH potential for this function.

1) 55.1 NO. Does most runoff or surface water entering the Assessment Area have a concentration of suspended solids (preferably inorganic) almost always below 25 mg/l, and/or a secchi disc reading consistently greater than 8 m (26.4 ft)?

2) 25.1 YES. Is there any feature that is a source, or potential source, of inorganic sediment to the Assessment Area? Consider stormwater outfalls, irrigation return waters, surface mines, or areas (those areas comprising 1 acre or 2% of the buffer zone or an area within 0.5 miles at least as large as the AA's wetland acreage) containing any of the following: exposed soils associated with agriculture, lands cleared within the last 2 years, soil-slope conditions classified by SCS as eroding or erosion hazard (e.g., subclass "e" in the SCS Land Classification Codes), gullies, sand or gravel pits, or severely eroding stream or road banks.

3) 25.3 YES. Are any of the following true?

a) Erosion is caused by drastic fluctuation in water levels due to artificial manipulation or extensive urban runoff.

b) Slopes immediately adjacent to the wetland are steeper than 10% (or steeper than 1% if alluvial clays prevail) and are unstable.

c) Boating causes frequent wakes that impinge on the deepwater fringe of the AA.

d) Tributaries immediately upstream of the AA have been channelized.

4) 27.1 YES. Is there any feature that is a source, or a potential source, of waterborne toxic substances (hazardous to aquatic life at typical exposure levels) to the AA? Consider industrial and sewage outfalls, mines, landfills, leaking subsurface tanks, salt/brine seepage, pesticide-treated areas, contaminated aquifers, severe oil runoff, irrigation return water, heavily traveled highways, or water inputs significantly contaminated by the above farther upstream. Also, consider observed fish kills and actual measurement of hazardous levels.

If any of the above were TRUE, the Assessment Area should be rated HIGH for the function. If they were all FALSE, go to List A, below. If all of the questions in List A are TRUE, the wetland is rated MODERATE for the function.

List A:

---

1) 21A NO or 1.2 YES.

21A. Is the dominant land cover of the watershed forest and scrub?

1.2. Is the Assessment Area located in any of the intense storm regions shown in Figure 7 (CA note: Maryland is not in the storm region) or is the rainfall erosivity factor (E130 in the Universal Soil Loss Equation) greater than 300 (info from local SCS), and if tidal, is tidal range less than 3 feet.

2) 5.1.1 YES. Is the percentage of the Wet Depression's watershed acreage accounted for by the Wet Depression less than 5% (or less than 10% if the region is dry)?

3) 5.2 NO and 34.2 NO.

5.2. Do upslope Wetland Depressions comprise more than 5% of the watershed of the Wetland Depression being evaluated (see figure 9, page 50 for example).

34.2. Is the Assessment Area located less than 2 miles downslope from a large impoundment (deeper than 20 feet at the outlet), or is the AA's water table demonstrably influenced by any other type of upstream impoundment?

If all of the above questions from List A were answered TRUE, then the wetland is rated MODERATE for this function. If all of the questions from List A were not true for the wetland, answer the questions set out below.

If question 1 below is answered TRUE, and any part of question 2 is TRUE, the wetland is rated MODERATE for the function. If question 1 is answered FALSE, and any part of question 2 is answered FASLE, the wetland is rated LOW for that function.

1) 8.1 YES. Does surface water enter the Assessment Area or connect it to other water bodies via a constricted or unconstricted permanent inlet?

2) Any of the questions in List A, above.

Nutrient Removal/Transformation Effectiveness

The answers to these questions are to be those in the "X" column of the answer sheet. If these are not available, use the answers in the "W" column, or as a last resort, use the answers in the "D" column.

If either of the following two questions are true, the wetland is rated HIGH for this function.

8.3 NO and 8.4 NO. Does surface water enter the Assessment Area or connect it to other water bodies via a constricted or unconstricted:*

8.3 Permanent outlet?
8.4 Intermittent Outlet?

*If this is a fringe wetland (wetland width is not more than 3x the width of the channel) answer YES to both inlet and outlet questions. Do not consider precipitation or overland sheet flow to be surface water.

9.2 YES. Does floodwater from an adjoining body of water enter the Assessment area as sheetflow (e.g., as when a river or lake overtops a levee over a wide area) AND exit the AA through constricted outlets or not at all (see figure 14, p.54).

If BOTH of the above answers are false, answer the following three questions. If any of them are true, the wetland is rated as LOW for this function.

28 YES. Is either of the following conditions true?

a) Most of the Assessment Area has been tilled, filled, or excavated at least once in the past 3 years.

b) An outlet has recently been added to the AA's wet depression where none previously existed, OR an inlet has recently been blocked off and an outlet is still present.

12E YES. Select the one class and subclass of vegetation that is dominant* in Assessment Area. Now, select the one class and subclass (if different from above) that is dominant at the edge of open water in Zones B or C (see figure 15, p.56) excluding areas of submerged vegetation in Zone B (sB). Now, select the one class and subclass (if different from above) that have root and lower stem contact with water over the largest area of the AA's wetland. This is:

12E Moss-lichen.

*"Dominant" is the class and subclass with the largest percentage of cover. However, if 12.A-forested and 12.B-scrub/shrub together, or 12.C-aquatic bed and 12.D-emergent together comprise a greater percentage of cover than any other class, answer "YES" to the larger of the two classes. You may also use this procedure on a subclass level by grouping evergreens (all 4), deciduous (all 4), dead (both). For example, if the four evergreen subclasses together comprise a greater percentage of cover than any single subclass, answer YES to the largest of the four subclasses.

5) 7 YES or 41.2 YES (Question 7 states that it should be answered only if question 41 could not be answered. However, question 41 states that it (41) should only be answered if question 7 cannot be answered).

7 NO. Is the channel gradient of the Assessment Area less than the gradient shown in Table 3? Measure the AA's gradient using the finest scale topographic map available (figure 12, page 53).

Table 3. Gradinet necessary to create depositional velocity conditions (interpreted from SCS curves for channel flow).

M.Depth(ft)	N>0.1251 [a]	N=0.0802 [b]	N=0.0503 [c]	N<0.0354 [d]
<0.5	<0.0250	<0.0100	<0.0038	<0.0018
0.5-1	<0.0150	<0.0060	<0.0023	<0.0012
1-2	---	<0.0030	<0.0012	<0.0006
2-3	---	<0.0017	<0.0006	<0.0003
3-45	---	<0.0013	<0.0005	<0.0002
4-65	---	<0.0008	<0.0003	<0.0001
6-85	---	<0.0006	<0.0002	<0.0001
8-105	---	<0.0004	<0.002	---

N is the Manning roughness coefficient. They are described below.

a. Most densely wooded floodplains.
b. Most densely vegetated emergent wetlands not totally submerged by flood flows.
c. Most moderately vegetated or totally submerged (by flood waters) emergent wetlands, or with boulders.
d. Mostly unobstructed channels.

41.2 YES. During annual peak flow is velocity throughout most of the Assessment Area greater than 1.5 ft/sec or greater than 3.3 ft/sec AND substrate is cobble-gravel.

If any of the above 3 questions were answered true, then the wetland is rated LOW for this function.

If they were answered false, go to List A (for this function).

List A:

1) 7 YES or 41.1 YES or (12A/B/Cb/Da YES).

7 YES. Is the channel gradient of the Assessment Area less than the gradient shown in Table 3? Measure the AA's gradient using the finest scale topographic map available (figure 12, page 53).

Table 3. Gradinet necessary to create depositional velocity conditions (interpreted from SCS curves for channel flow).

M.Depth(ft)	N>0.1251 [a]	N=0.0802 [b]	N=0.0503 [c]	N<0.0354 [d]
<0.5	<0.0250	<0.0100	<0.0038	<0.0018
0.5-1	<0.0150	<0.0060	<0.0023	<0.0012
1-2	---	<0.0030	<0.0012	<0.0006
2-3	---	<0.0017	<0.0006	<0.0003
3-45	---	<0.0013	<0.0005	<0.0002
4-65	---	<0.0008	<0.0003	<0.0001
6-85	---	<0.0006	<0.0002	<0.0001
8-105	---	<0.0004	<0.002	---

N is the Manning roughness coefficient. They are described below.

a. Most densely wooded floodplains.
b. Most densely vegetated emergent wetlands not totally submerged by flood flows.
c. Most moderately vegetated or totally submerged (by flood waters) emergent wetlands, or with boulders.
d. Mostly unobstructed channels.

41.1 YES. During annual peak flow is velocity throughout most of the Assessment Area less than 0.3 ft/sec, or if unknown, is most of the AA flooded for less than 5 days annually?

12A/B/Cb/Da YES. Select the one class and subclass of vegetation that is dominant* in the Assessment Area. Now, select the one class and subclass (if different from above) that is dominant at the edge of open water in Zones B or C (see figure 15, p.56) excluding areas of submerged vegetation in Zone B (sB). Now, select the one class and subclass (if different from above) that have root and lower stem contact with water over the largest area of the AA's wetland. This is:

12A Forested
12B Scrub-Shrub
12Cb Aquatic bed and floating vascular
12Da Emergent and persistent

*"Dominant" is the class and subclass with the largest percentage of cover. However, if 12.A-forested and 12.B-scrub/shrub together, or 12.C-aquatic bed and 12.D-emergent together comprise a greater percentage of cover than any other class, answer "YES" to the larger of the two classes. You may also use this procedure on a subclass level by grouping evergreens (all 4), deciduous (all 4), dead (both). For example, if the four evergreen subclasses together comprise a greater percentage of cover than any single subclass, answer YES to the largest of the four subclasses.

2) (24.1 YES or 24.2 YES) And 56.1 NO.

a) 24.1 (Answer "U" is unknown) Are the soil types present in the Assessment Area known to contain more than 4,000 mg/kg (dry weight) of amorphous aluminum in the upper 8 inches?

b) 24.2 (answer only if no data are available for question 24.1). Is either of the following conditions present?

1)Soil maps idicate presence of alluvial (e.g., fluvaquent), ferric, clay, or other primarily fine mineral soils in the AA.

2)The map in Figure 24 (page 63) shows the soils of this region to normally hve elevated concentrations of aluminum (>6%) or iron, and analysis indicates there is less than 20% organic matter by weight in the upper 3 inches of sediment.

c) Is alkalinity ($CaCO_3$) less than 20 mg/l (Answer "I" to this question is AA is not accessible to fish).

3) (12Aa + 12 Ba NO) And 23 NO and 17 YES

12Aa +12Bb. Select the one class and subclass of vegetation that is dominant* in the Assessment Area. Now, select the one class and subclass (if different from above) that is dominant at the edge of open water in Zones B or C (see figure 15, p.56) excluding areas of submerged vegetation in Zone B (sB). Now, select the one class and subclass (if different from above) that have root and lower stem contact with water over the largest area of the AA's wetland. This is:

12Aa YES Forested and dead
12Bb YES Scrub-Shrub and needle-leaved evergreen.

*"Dominant" is the class and subclass with the largest percentage of cover. However, if 12.A-forested and 12.B-scrub/shrub together, or 12.C-aquatic bed and 12.D-

emergent together comprise a greater percentage of cover than any other class, answer "YES" to the larger of the two classes. You may also use this procedure on a subclass level by grouping evergreens (all 4), deciduous (all 4), dead (both). For example, if the four evergreen subclasses together comprise a greater percentage of cover than any single subclass, answer YES to the largest of the four subclasses.

23 NO Do functioning ditches, canals, levees, or similar artificial features (excluding those built specifically for wildlife management) within the AA, or at its inlet or outlet, confine surface water to a narrower part of the AA than it would without such features?

4) (36.1.2 YES + 26.2 YES) or 36.2.3 YES + 26.3 YES + (9.1 YES or 9.2 YES) + (7 YES or 41.1 YES)

36.1.2 YES. Is the average width of the area in Zone A and B that supports erect (eB) or robust (rB) vegetation greater than 500 ft, or the wet depression is constricted and erect vegetation (eB) is present throughout.

26.2 YES. (Note: the manual states that if 26.1 was answered "no", 26.2 should be answered "I". Question 26.1 is: Are any of the following a source, or a potential source, of nutrients to the Assessment Area? a) Sewage outfalls, phosphate mines, tile drains, canals and other nutrient rich sources. b) Areas containing anuy of the following: feedlots, active pastureland, landfills, septic fields, fertilized soils, soils tilled, burned, or cleared within the last 2 years. c) Actual observance of nuisance algal blooms or measurement of excessive nutrient concentrations. d) Areas where the acreage of the Wetland Depression divided by the number of houses with septic systems within the buffer zone is less than 8. e) Areas where the acreage of the WD is divided by the number of peiple within the buffer zone (including those beyond the buffer zone if their wastes are carried to the buffer zone, or AA, by a collector-outfall system) is less than 25.). Is overland sheetflow the primary source of nutrients entering the Assessment Area?

36.2.3 YES. Is the average width of the area in Zone A and B that supports erect (eB) or robust (rB) vegetation greater than 500 ft, or alternatively, the WD is constricted, emergent vegetation is present throughout, and stem density is approximately 50 stems per meter or greater?

26.3 YES. (Note: the manual states that if 26.1 was answered "no", 26.2 should be answered "I". Question 26.1 is: Are any of the following a source, or a potential source, of nutrients to the Assessment Area? a) Sewage

outfalls, phosphate mines, tile drains, canals and other nutrient rich sources. b) Areas containing anuy of the following: feedlots, active pastureland, landfills, septic fields, fertilized soils, soils tilled, burned, or cleared within the last 2 years. c) Actual observance of nuisance algal blooms or measurement of excessive nutrient concentrations. d) Areas where the acreage of the Wetland Depression divided by the number of houses with septic systems within the buffer zone is less than 8. e) Areas where the acreage of the WD is divided by the number of peiple within the buffer zone (including those beyond the buffer zone if their wastes are carried to the buffer zone, or AA, by a collector-outfall system) is less than 25.). Is channel flow the primary source of nutrients entering the AA?

9.1 YES. Is the total width of the Assessment Area's outlet(s), at high flow, less than one-third the average width of the AA measured perpendicular to flow (or one-tenth if no gradient or tidal flow is present), or is the cross-sectional area of the outlet(s) clearly less than that of the inlet(s), thus causing "ponding" (see figure 13, p.54).

9.2 YES. Does floodwater from an adjoining body of water enter the AA as sheetflow (e.g., as when a river or lake overtops a levee over a wide area) and exit the AA through constricted outlets or not at all (see figure 14, p.54).

7 YES. Is the channel gradient of the Assessment Area less than the gradient shown in Table 3? Measure the AA's gradient using the finest scale topographic map available (figure 12, page 53).

Table 3. Gradinet necessary to create depositional velocity conditions (interpreted from SCS curves for channel flow).

M.Depth(ft)	N>0.1251 [a]	N=0.0802 [b]	N=0.0503 [c]	N<0.0354 [d]
<0.5	<0.0250	<0.0100	<0.0038	<0.0018
0.5-1	<0.0150	<0.0060	<0.0023	<0.0012
1-2	---	<0.0030	<0.0012	<0.0006
2-3	---	<0.0017	<0.0006	<0.0003
3-45	---	<0.0013	<0.0005	<0.0002
4-65	---	<0.0008	<0.0003	<0.0001
6-85	---	<0.0006	<0.0002	<0.0001
8-105	---	<0.0004	<0.002	---

N is the Manning roughness coefficient. They are described below.

a. Most densely wooded floodplains.
b. Most densely vegetated emergent wetlands not totally submerged

by flood flows.

c. Most moderately vegetated or totally submerged (by flood waters) emergent wetlands, or with boulders.

d. Mostly unobstructed channels.

41.1 YES. During annual peak flow is velocity throughout most of the AA less than 0.3 ft/sec, or if unknown, is most of the AA flooded for less than 5 days annually?

5) 33 A/E/J/K YES. Which of the hydroperiods listed in Question 32 best describes the portion of the AA, or the contiguous, accessible deeper waters, that are inundated or saturated for the longest part of the year, and comprises at least 1 acre or 10% of the AA.

33A. Permanently flooded non-tidal.
33E. Saturated (no standing water) non-tidal.
33J. Irregularly exposed tidal.
33K. Irregularly flooded tidal.

If most of List A is answered true, the wetland is rated HIGH for this function.

However, if questions #2, #4, and #5 from list A (shown below) are answered false, the wetland is rated LOW for this function.

2) (24.1 YES or 24.2 YES) And 56.1 NO.

a) 24.1 (Answer "U" is unknown) Are the soil types present in the Assessment Area known to contain more than 4,000 mg/kg (dry weight) of amorphous aluminum in the upper 8 inches?

b) 24.2 (answer only if no data are available for question 24.1). Is either of the following conditions present?

1)Soil maps idicate presence of alluvial (e.g., fluvaquent), ferric, clay, or other primarily fine mineral soils in the AA.

2)The map in Figure 24 (page 63) shows the soils of this region to normally hve elevated concentrations of aluminum (>6%) or iron, and analysis indicates there is less than 20% organic matter by weight in the upper 3 inches of sediment.

c) Is alkalinity ($CaCO_3$) less than 20 mg/l (Answer "I" to this question is AA is not accessible to fish).

4) (36.1.2 YES + 26.2 YES) or 36.2.3 YES + 26.3 YES + (9.1 YES or 9.2 YES) + (7 YES or 41.1 YES)

36.1.2 YES. Is the average width of the area in Zone A

and B that supports erect (eB) or robust (rB) vegetation greater than 500 ft, or the wet depression is constricted and erect vegetation (eB) is present throughout.

26.2 YES. (Note: the manual states that if 26.1 was answered "no", 26.2 should be answered "I". Question 26.1 is: Are any of the following a source, or a potential source, of nutrients to the Assessment Area? a) Sewage outfalls, phosphate mines, tile drains, canals and other nutrient rich sources. b) Areas containing anuy of the following: feedlots, active pastureland, landfills, septic fields, fertilized soils, soils tilled, burned, or cleared within the last 2 years. c) Actual observance of nuisance algal blooms or measurement of excessive nutrient concentrations. d) Areas where the acreage of the Wetland Depression divided by the number of houses with septic systems within the buffer zone is less than 8. e) Areas where the acreage of the WD is divided by the number of peiple within the buffer zone (including those beyond the buffer zone if their wastes are carried to the buffer zone, or AA, by a collector-outfall system) is less than 25.). Is overland sheetflow the primary source of nutrients entering the Assessment Area?

36.2.3 YES. Is the average width of the area in Zone A and B that supports erect (eB) or robust (rB) vegetation greater than 500 ft, or alternatively, the WD is constricted, emergent vegetation is present throughout, and stem density is approximately 50 stems per meter or greater?

26.3 YES. (Note: the manual states that if 26.1 was answered "no", 26.2 should be answered "I". Question 26.1 is: Are any of the following a source, or a potential source, of nutrients to the Assessment Area? a) Sewage outfalls, phosphate mines, tile drains, canals and other nutrient rich sources. b) Areas containing anuy of the following: feedlots, active pastureland, landfills, septic fields, fertilized soils, soils tilled, burned, or cleared within the last 2 years. c) Actual observance of nuisance algal blooms or measurement of excessive nutrient concentrations. d) Areas where the acreage of the Wetland Depression divided by the number of houses with septic systems within the buffer zone is less than 8. e) Areas where the acreage of the WD is divided by the number of peiple within the buffer zone (including those beyond the buffer zone if their wastes are carried to the buffer zone, or AA, by a collector-outfall system) is less than 25.). Is channel flow the primary source of nutrients entering the AA?

9.1 YES. Is the total width of the Assessment Area's outlet(s), at high flow, less than one-third the average width of the AA measured perpendicular to flow (or one-

tenth if no gradient or tidal flow is present), or is the cross-sectional area of the outlet(s) clearly less than that of the inlet(s), thus causing "ponding" (see figure 13, p.54).

9.2 YES. Does floodwater from an adjoining body of water enter the AA as sheetflow (e.g., as when a river or lake overtops a levee over a wide area) and exit the AA through constricted outlets or not at all (see figure 14, p.54).

7 YES. Is the channel gradient of the Assessment Area less than the gradient shown in Table 3? Measure the AA's gradient using the finest scale topographic map available (figure 12, page 53).

Table 3. Gradinet necessary to create depositional velocity conditions (interpreted from SCS curves for channel flow).

	a	b	c	d
M.Depth(ft)	N>0.1251	N=0.0802	N=0.0503	N<0.0354
<0.5	<0.0250	<0.0100	<0.0038	<0.0018
0.5-1	<0.0150	<0.0060	<0.0023	<0.0012
1-2	---	<0.0030	<0.0012	<0.0006
2-3	---	<0.0017	<0.0006	<0.0003
3-45	---	<0.0013	<0.0005	<0.0002
4-65	---	<0.0008	<0.0003	<0.0001
6-85	---	<0.0006	<0.0002	<0.0001
8-105	---	<0.0004	<0.002	---

N is the Manning roughness coefficient. They are described below.

a. Most densely wooded floodplains.
b. Most densely vegetated emergent wetlands not totally submerged by flood flows.
c. Most moderately vegetated or totally submerged (by flood waters) emergent wetlands, or with boulders.
d. Mostly unobstructed channels.

41.1 YES. During annual peak flow is velocity throughout most of the AA less than 0.3 ft/sec, or if unknown, is most of the AA flooded for less than 5 days annually?

5) 33 A/E/J/K YES. Which of the hydroperiods listed in Question 32 best describes the portion of the AA, or the contiguous, accessible deeper waters, that are inundated or saturated for the longest part of the year, and comprises at least 1 acre or 10% of the AA.

33A. Permanently flooded non-tidal.
33E. Saturated (no standing water) non-tidal.
33J. Irregularly exposed tidal.
33K. Irregularly flooded tidal.

If the above questions from List A were answered false, the wetland is rated as LOW for this function.

If the 2 questions listed below are answered false, the wetland is rated LOW for this function. If they are answered true, the wetland is rated MODERATE for the function.

36.1.1 NO and 36.2.1 NO.

> 36.1.1 NO. Is the average width of the area in Zone A and B that supports erect (eB) or robust (rB) vegetation less than 20 ft?
>
> 36.2.1 NO. Is the average width (average width is measured along a line roughly perpendicular to flow, drawn from the upland edge to the deep water. If average width cannot be determined using this method, calculate average width by dividing the area of erect vegetation in Zones A and B by twice its length parallel to open water (or, if no open water, by its maximum dimension) (see figure 28, p.71) of the area in Zone B that supports erect (eB) or robust (rB) vegetation, and where depth seldom exceeds 50% plant height, less than 20 feet?

If the above 2 questions were answered false, the wetland is rated LOW for the function. If the questions were answered true, the wetland is rated HIGH for the function.

Nutrient Removal/Transformations Opportunity

For this key, use the answers in the "X" column of the answer sheet. If these are not available, use the answers in the "W" column, or as a last resort the answers in the "D" column.

If the following question is answered true, the wetland is rated HIGH for this function.

26.1 YES. Are any of the following a source, or a potential source, of nutrients to the Assessment Area?

a) Sewage outfall, phosphate mines, tile drains, canals and other nutrient rich sources.

b) Areas containing any of the following: feedlots, active pasture land, landfills, septic fields, fertilized soils, soils tilled, burned, or cleared within the last 2 years.

c) Actual observances of nuisance algal blooms or measurement of excessive nutrient concentrations.

d) Areas where the acreage of the WD divided by the number of houses with septic systems within the buffer zone is less than 8.

e) Areas where the acreage of the WD divided by the number of people within the buffer zone (including those beyond the buffer zone if their wastes are carried to the buffer zone, or AA, by a collector-outfall system) is less than 25.

If the above question is answered false, then go to List A (for this function).

List A:

1) 1.2 YES or 21A NO.

1.2 YES. Is the AA located in any of the intense storm regions shown in Figure 7 (p. 49) or is the rainfall erosivity factor (E130 in the Universal Soil Loss Equation) greater than 300.

21A NO. Is the dominant ("Dominant" means the greatest percentage of total land cover. However, if 21B,C, and E together comprise a greater percentage than any other type, answer affirmatively the largest of these three land types) land cover of the watershed forest and scrub?

2) 5.1.1 YES or 4.2C/D YES.

5.1.1 YES. Does the Wetland Depression comprise less than 5% of the it's watershed?

4.2C/D YES. The area of the AA's watershed (ignoring the 5 mile limitation imposed by WET's definition of watershed) in square miles is:

4.2C YES. 100-2,500.

4.2D YES. Greater than 2,500.

3) 5.2 NO. Do upslope Wetland Depressions comprise more than 5% of the total acreage of the watershed of this wetland depression?

If all of the above questions in List A are answered true, the wetland is rated MODERATE for this function. If all of the questions are not true, go to the following 2 questions.

If both of the following two questions are true, the wetland is rated MODERATE for this function. If they are false, the wetland is rated LOW for this function.

1) ANY of the questions in List A (see above).

2) 8.1 YES. Does surface water enter the AA or connect it to other water bodies via a constricted or uncostricted permanent inlet?

If both of the above two questions are true, the wetland is rated MODERATE for this function. If they are false, the wetland is rated LOW for this function.

Wetlands Assessments using WET

Wetland #5. Indian Creek (Washington East quad)

This is an area of of mixed emergent/scrub-shrub wetland merging into forested wetland. It is located off of Greenbelt Road. Get to the site by taking Greenbelt Road off of Route 1 in College Park and then taking the first left after the two parts of Greenbelt Road merge. Take this road back to the railroad tracks and turn left. The wetland is on the far (west) side of the tracks.

The ratings for the various functions are as follows:

Sediment/toxicant retention Effectiveness ------ High
Sediment/toxicant retention Opportunity ------ High
Nutrient Removal/transformation Effectiveness -- High
Nutrient Removal/transformation Opportunity ---- Moderate

Discussion of Results:

A. Sediment/Toxicant Retention Effectiveness

This wetland does not have the characteristics that would automatically result in a high rating (see discussion of keys, above). However, due to the presence of a small stand of emergent vegetation this wetland also did not have those characteristics which would have automatically resulted in a low rating. The following "box" of the key is the last opportunity for a wetland to get a high rating.

This wetland received a high rating here because it met several of the possible criteria for such a ranking. First, velocity of the water in the wetland was low, second, the berm around the wetland created a flooding condition, and third, the combination of no long-term erosion, persistent emergent vegetation, and forest and scrub-shrub vegetation are all present. The presence of a delta (question 22.2) was considered to be a non-essential sign of sediment deposition in this wetland, and question 19.2 (wave protection) was not required to be answered for palustrine wetlands.

B. Sediment/Toxicant Retention Opportunity

This wetland is downstream from a heavily travelled road and a large area that has been cleared of forest for future development. Both of these areas represent possible significant sources of sediment to the wetland.

C. Nutrient Removal/Transformation Effectiveness

Again, this wetland lacked the characteristics that would have automatically resulted in a high rating. The initial requirements for high nutrient removal/transformation are similar to those for sediment/toxicant retention (see key discussion, above). However, it also lacked the characteristics that would have resulted in an immediate low rating (see key). The key pathway therefor led into NR/TE List A, where "most" of the questions had to be answered true for the wetland to get a high rating.

Question 56.1 (alkalinity not low) in List A was considered to be non-essential in List A for this function and was not used. Critical questions in this key appeared to be the presence of high plant diversity in the wetland (question 17), the presence of standing water or saturated soil in the wetland as the dominant hydroperiod, and the lack of dead forest or scrub/shrub vegetation. As was seen in the key discussion, above, the first two questions are particularly critical when dealing with forested wetlands.

D. Nutrient Removal/Transformation Opportunity

The wetland was rated moderate for this function. For the wetland to be ranked high for this function some identifiable source of nutrients must be present. If not, other parts of the key are used (see key discussion, above). This wetland had no easily identifiable nutrient source.

Wetland #7. Beaverdam Creek (Beltsville quad)

This is a very extensive wetland on the grounds of the U.S.D.A. Research Center in Beltsville. It contains predominantly forested wetlands but also contains some emergent wetlands. It stretches between Research Road (on the U.S.D.A. grounds) and Edmonston Avenue, a distance of about a mile.

The ratings for the various functions are as follows:

Sediment/toxicant retention Effectiveness ------ High
Sediment/toxicant retention Opportunity ------ High
Nutrient Removal/transformation Effectiveness -- High
Nutrient Removal/transformation Opportunity ---- High

Discussion of results:

A. Sediment/Toxicant Retention Effectiveness

This wetland was rated high for this function immediately since it satisfied the requirement of a large, sheet-flow inlet land constricted outlet. In my interpretation, the constricted outlet requirement was satisfied by the berm formed by Edmonston Road, at the western boundary of the wetland. This berm probably results in overbank water backing up in the wetland. This wetland would have also been ranked as high based on the third question in the initial key "box". This question required that substantial erect vegetation be present in zones A and B (#36.1.2) and that there be no evidence of erosion on aerial photos (#22.3). The size of this wetland undoubtedly played a role in it's rating, since size makes it more probable that "erect" vegetation will be present

B. Sediment/Toxicant Retention Opportunity

This wetland was rated high for this function since the presence of stormwater outfalls and agricultural fields in the watershed constitute potential sediment sources.

C. Nutrient Removal/Transformation Effectiveness

The wetland was rated high for this function for the same reason that it was rated high for the sediment function (i.e., sheetflow inlet waters and a constricted outlet). If it had not had a constricted outlet is would still have been rated high for the function due primarily to the presence of a diversity of wetland types (#17).

D. Nutrient Removal/Transformation Opportunity

The wetland was rated high for this function due to the presence of fertilized, tilled, and pastured land in the watershed.

Wetland #9. Paint Branch (Washington East quad)

This a forested wetland site. Reach this site by going west on Metzerott Road (east is Greenbelt Road) off of Route 1 in College Park, and turning at the park as soon as you cross the bridge over Paint Branch. The wetland forest borders the creek. Paint Branch flows south, goes under Route 1 by the entrance to U of Maryland, and then merges with Indian Creek in Berwyn Heights.

The ratings for the various functions are as follows:

Sediment/toxicant retention Effectiveness ------ Low
Sediment/toxicant retention Opportunity ------ Moderate
Nutrient Removal/transformation Effectiveness -- Low
Nutrient Removal/transformation Opportunity ---- Moderate

Discussion of Results:

A. Sediment/Toxicant Retention Effectiveness

The wetland was rated low for this function. This wetland is a floodplain forest with no contiguous road berm to constrict the flow of water. Since there is no "erect" vegetation in the wetland the second key "box" is consulted. In this portion of the key, any true answer results in the wetland getting a low rating. Question #1 resulted in the low rating for this wetland, since water depths are going to be less than 39 inches (43A/B/C/D/E), and the percentage of zones B and C which, taken together, contain emergent vegetation is 0. The other sections of this question are the degree of sheltering from wind (19.1) and the amount of submerged vegetation in Zone B (31.4). Question 19.1 did not appear to be applicable to this type of wetland, and question 31.4 was answered "I" as was indicated in the WET directions if the submerged vegetation zone was missing. If the question is still regarded as valid with those two parts of it varying from the given answer in the key, the wetland is rated low for the function.

If it is assumed that the "I" answer and the removal of 19.1 invalidates the question, and the assessment is taken further in the key, this wetland still is given a low rating. Critical points come in List A, where "erect" vegetation is required in the first part (36.1.1) and a constricted outlet is required in the second part (9.1). The inability of this wetland to satisfy these requirements brings List B into play. In this section the wetland is required to be a non-palustrine wetland (10C/D/E/F) and have a salinity of above 0.5 ppt (48B) in order to receive a moderate rating. This floodplain wetland could not satisfy these requirements and received a low rating.

B. Sediment/Toxicant Retention Opportunity

The wetland received a moderate rating for this function. There were no obvious sources of sediment to the wetland, although "measured" suspended solids, if taken during overbank flow, may have given this wetland a high rating.

C. Nutrient Removal/Transformation Effectiveness

This wetland received a low rating for this function. It did not receive a high rating due to the same factors that kept it from a high rating for sediment retention (no constricted outlet). Critical points for receiving a low rating occurred in List A. The requirements that the wetland could not meet included high diversity of vegetation classes (17), extensive "erect" vegetation in zones A and/or B (36.1.2 and 36.2.3), and a hydroperiod classified as either permanently flooded or saturated (33A/E).

D. Nutrient Removal/Transformation Effectiveness

The wetland was rated as moderate for this function. There was no obvious source of nutrients to the wetland, which rules out a high rating, but the wetland met the requirements of List A, which resulted in a moderate rating. These requirements included a watershed that was not predominantly forested, the wetland comprising less than 5% of the area of the watershed, and upslope wetlands not comprising more than 5% of the wetland's watershed.

Wetland #10. Little Paint Branch (Beltsville quad)

There are two wetland forests here. Both are PFO1A. They are located on either side of Little Paint Branch where that stream crosses Cherry Hill road. However, due to the definition of wetlands of a certain size, both of these wetlands are defined as a single wetland. Get to this site by going west on Cherry Hill road off of Route 1 in College Park. Little Paint Branch merges with Paint Branch south of this site at the Paint Branch Golf Course, and then flows through site #9, above.

The ratings for the various functions are as follows:

Sediment/toxicant retention Effectiveness ------ High
Sediment/toxicant retention Opportunity ------ High
Nutrient Removal/transformation Effectiveness -- High
Nutrient Removal/transformation Opportunity ---- High

Discussion of results:

A. Sediment/Toxicant Retention Effectiveness

The wetland received a high rating for this function at the beginning of the key due to a highway berm which constricted the outflow.

B. Sediment/Toxicant Retention Opportunity

The wetland received a high rating for this function due to recently cleared land in the watershed.

C. Nutrient Removal/Transformation Effectiveness

The wetland received a high rating for this function as a result of the highway berm that constricted the outflow of water.

D. Nutrient Removal/Transformation Opportunity

The wetland received a high rating due to the presence of fertilized agricultural land in the watershed.

Wetland #18. Northwest Branch (Washington East quad)

There is a small, isolated wetland forest here (PFO1A). Get to it by taking University Boulevard west from Adelphi Road (by back entrance to U of MD), and then turning right (north) on West Park Drive. Stop when West Park Drive turns sharply west (into Lyndon Street). Northwest Branch merges with the Northeast Branch to form the Anacostia River.

The ratings for the various functions are as follows:

Sediment/toxicant retention Effectiveness ------ Low
Sediment/toxicant retention Opportunity ------ Moderate
Nutrient Removal/transformation Effectiveness -- Low
Nutrient Removal/transformation Opportunity ---- Moderate

Discussion of Results:

A. Sediment/Toxicant Retention Effectiveness

The wetland was rated low for this function. This wetland is a floodplain forest with no contiguous road berm to constrict the flow of water. Since there is no "erect" vegetation in the wetland the second key "box" is consulted. In this portion of the key, any true answer results in the wetland getting a low rating. Question #1 resulted in the low rating for this wetland, since water depths are going to be less than 39 inches (43A/B/C/D/E), and the percentage of zones B and C which, taken together, contain emergent vegetation is 0. The other sections of this question are the degree of sheltering from wind (19.1) and the amount of submerged vegetation in Zone B (31.4). Question 19.1 did not appear to be applicable to this type of wetland, and question 31.4 was answered "I" as was indicated in the WET directions if the submerged vegetation zone was missing. If the question is still regarded as valid with those two parts of it varying from the given answer in the key, the wetland is rated low for the function.

If it is assumed that the "I" answer and the removal of 19.1 invalidates the question, and the assessment is taken further in the key, this wetland still is given a low rating. Critical points come in List A, where "erect" vegetation is required in the first part (36.1.1) and a constricted outlet is required in the second part (9.1). The inability of this wetland to satisfy these requirements brings List B into play. In this section the wetland is required to be a non-palustrine wetland (10C/D/E/F) and have a salinity of above 0.5 ppt (48B) in order to receive a moderate rating. This floodplain wetland could not satisfy these requirements and received a low rating.

B. Sediment/Toxicant Retention Opportunity

The wetland received a moderate rating for this function. There were no obvious sources of sediment to the wetland, although "measured" suspended solids, if taken during overbank flow, may have given this wetland a high rating.

C. Nutrient Removal/Transformation Effectiveness

This wetland received a low rating for this function. It did not receive a high rating due to the same factors that kept it from a high rating for sediment retention (no constricted outlet). Critical points for receiving a low rating occurred in List A. The requirements that the wetland could not meet included high diversity of vegetation classes (17), extensive "erect" vegetation in zones A and/or B (36.1.2 and 36.2.3), and a hydroperiod classified as either permanently flooded or saturated (33A/E).

D. Nutrient Removal/Transformation Effectiveness

The wetland was rated as moderate for this function. There was no obvious source of nutrients to the wetland, which rules out a high rating, but the wetland met the requirements of List A, which resulted in a moderate rating. These requirements included a watershed that was not predominantly forested, the wetland comprising less than 5% of the area of the watershed, and upslope wetlands not comprising more than 5% of the wetland's watershed.

Wetland #22. Northwest Branch (Kensington Quad)

There is a small wetland forest here (PFO1A) located on a small tributary of the Northwest Branch. Get to it by taking University Boulevard west from College Park and then turning right (north) on Arcola Avenue, and then turning right again on Kemp Mill Road. The site is located on Kemp Mill road, right where Glenallen Avenue intersects it.

The ratings for the various functions are as follows:

Sediment/toxicant retention Effectiveness ------ High
Sediment/toxicant retention Opportunity ------ Low
Nutrient Removal/transformation Effectiveness -- High
Nutrient Removal/transformation Opportunity ---- Low

Discussion of the Results:

A. Sediment/Toxicant Retention Effectiveness

The wetland was rated high for this function, due to the lack of an outlet combined with sheet flow input (B.4). This wetland differs from the other forested wetlands examined in that it parallels a roadway and appears to receive runoff from the overflow of the nearby creek. This runoff appears to stay in the wetland due to the topography of the area.

B. Sediment/Toxicant Retention Opportunity

The wetland was rated low for this function. There were no obvious sources of sediment to the wetland. The critical question in this function pertained to the presence of a permanent inlet to the wetland. If the wetland had a permanent inlet, it would have received a moderate rating. However, the wetland had an intermittent inlet, which resulted in the low rating.

C. Nutrient Removal/Transformation Effectiveness

The wetland was rated high for this function for the same reasons as it was rated high for the sediment function.

D. Nutrient Removal/Transformation Opportunity

The wetland was rated low for this function. There were no obvious sources of nutrients to the wetland. The critical question in this function pertained to the presence of a permanent inlet to the wetland. If the wetland had a permanent inlet, it would have received a moderate rating. However, the wetland had an intermittent inlet, which resulted in the low rating.

Mays Chapel stormwater basin

This is a small (0.7 acre), artificial wetland constructed in 1985. There is a single inlet and outlet to the wetland. Approximately half of the wetland is vegetated with non-persistent vegetation. The watershed is 100 acres.

The ratings for the various functions are as follows:

Sediment/toxicant retention Effectiveness ------ High
Sediment/toxicant retention Opportunity ------ High
Nutrient Removal/transformation Effectiveness -- High
Nutrient Removal/transformation Opportunity ---- Moderate

Discussion of the results:

Same as results for Queen Anne site.

B. Sediment/Toxicant Retention Effectiveness

Same as results for Queen Anne site.

C. The wetland was rated high for this function. The critical point for the high rating for this wetland was the same as for the low rating for the Queen Anne site (i.e.,the presence of mineral soils, #24.2), except that in the case of this wetland mineral soils were present.

D. Nutrient Removal/Transformation Opportunity

Same as the Queen Anne site.

Queen Anne Stormwater site

This is a small (0.6 acre) artificial wetland constructed in 1987. The watershed, which is almost 100% impervious, has an area of 19 acres. The wetland is vegetated with both persistent and non-persistent vegetation. There is a single inlet and a single outlet.

The ratings for the various functions are as follows:

Sediment/toxicant retention Effectiveness ------ High
Sediment/toxicant retention Opportunity ------ High
Nutrient Removal/transformation Effectiveness -- Low
Nutrient Removal/transformation Opportunity ---- Moderate

Discussion of the Results:

A. Sediment/Toxicant Retention Effectiveness

The wetland was rated high for this function. The high rating was not received in the first key "box" due to the lack of sheet flow input (9.2), the presence of an outlet (8.4), and the lack of "erect" vegetation throughout the wetland. However, in the second key box, the presence of some emergent vegetation (31.6) gets the wetland through the box which can result in a low rating. In the third box the wetland meets the requirements of all three questions. Question 34.3.1, which is the presence downslope of a dike or dam which creates flooding, was considered to be met by the berm of the artificial wetland and the outlet structure itself. The wetland met the requirements of question 22.2, which is the presence of an actively accreting delta, due to the sediment deposition which is occurring just below the input pipe.

B. Sediment/Toxicant Retention Opportunity

The wetland was given a high rating at the beginning of the key due to measured suspended solids being greater than 25mg/l.

C. The wetland was rated low for this function. For the wetland to be rated high at the beginning of the key it would have to have sheet flow input (9.2) or have no outlet (8.4). The wetland received a low rating in List A. A critical point for this wetland was the lack of mineral soil in the wetland (24.2). This wetland was constructed using sand, and thus has no mineral soil. This, together with the lack of diversity of vegetation classes (17), the presence of channel flow instead of sheet flow (26.2), and the lack of a wide band of, or a total and dense stand of, emergent vegetation resulted in the low rating.

D. Nutrient Removal/Transformation Opportunity

The wetland was rated moderate for this function, due to the lack of an obvious source of nutrients. The wetland met the requirements of all the questions in List A, which included the absence of a forested or scrub/shrub watershed, a wetland surface area that is less than 5% of the watershed surface area, and a watershed where other wetlands make up less than 5% of the area of the total watershed.

P.G. County stormwater basin

This is a 1 acre artificial wetland with a 100 acre watershed. Most of the watershed is developed (non-residential) but there is still substantial development occurring. There are 2 inlets and one outlet for the wetland. The wetland was constructed in 1987.

The ratings for the various functions are as follows:

Sediment/toxicant retention Effectiveness ------ High
Sediment/toxicant retention Opportunity ------ High
Nutrient Removal/transformation Effectiveness -- High
Nutrient Removal/transformation Opportunity ---- Moderate

Discussion of Results:

A. Sediment/Toxicant Retention Effectiveness

The wetland was rated high at the beginning of the key for this function due to the presence of "erect" vegetation throughout the wetland (36.1.2). This erect vegetation is cattail which invaded the site shortly after it was constructed.

B. Sediment/Toxicant Retention Opportunity

The wetland was rated high at the beginning of the key due to the presence of a number of construction sites in the watershed. These sites are contributing sediment to the wetland.

C. Nutrient Removal/Transformation Effectiveness

The wetland was rated high for this function. This high rating occurred in List A, with the critical point being the presence of mineral soils (see the Mays Chapel and Queen Anne discussions).

D. Nutrient Removal/Transformation Opportunity

Same as Queen Anne site.

Sediment/Toxicant Retention (S/TR) Effectiveness Key

For the S/TR effectiveness interpretation use the answers in the "X" column of Form B. If these are not available use the answers in the "W" column, and as a last resort the answers in the "D" column.

ANY of the following:

1. (9.2=y)
   unconstricted inlet and constricted outlet
2. (8.3=n and 8.4=n)
   no outlet
3. (36.1.2=y and 22.3=n)
   substantial erect vegetation in Zones A and B and no evidence of erosion on aerial photos

T → HIGH

F ↓

ANY of the following:

1. [(19.1A=n)+(43A/B/C/D/E=y)+(31.4=n)+(31.6E=y)
   not sheltered and water depth <40 in. and sB<oB and B+C is 0% eB
2. (19.1B=y)
   unsheltered
3. (64=n)
   inlet inorganic solids < outlet inorganic solids
4. (28=y)
   direct alteration evident
5. [(7.2=y) or (41.2=y)]
   high velocity

T → LOW

F ↓

[(7.1=y) or (41.1=y) or (42.1.1=y)]
low velocity

AND ANY of the following:

1. (34.3.1=y)
   dike or dam downslope creates flooding
2. [(22.3=n)+(31.6A=n)+(12A/B/Da=y)+(22.2=y or 19.2=y)]
   no long-term erosion and BC is not 0% eB and forested/scrub-shrub or persistent emergent and actively accreting delta or island/peninsula part of AA

T → HIGH

F ↓

BOTH of the following:

1. [(7.1=y) or (41.1=y) or (31.1=n)]
   low velocity or Zone C > Zones A+B
2. (45E+F+G=n)
   substrate not bedrock, rubble or cobble-gravel

T ↓ ST/RE List A

F ↓ ST/RE List B

-- Continued --

ST/R Effectiveness Key cont.

ST/RE List A

BOTH of the following:

1. (13A/B/Da=y)
   partially forested, scrub-shrub or persistent emergent
2. [(36.1.1=n)+(25.2A=y)] OR [(36.2.1=n)+(25.2B=y)+(7.1=y)+(9.1/9.2=y)]
   erect vegetation in Zones A+B <20 ft wide and predominant sediment source is overland flow OR Zone eB usually <20 ft wide and predominant sediment source is channel flow and low velocity and constricted outlet

OR ALL of the following:

1. (9.1=y)
   constricted outlet
2. (10D/E=y)
   tidal riverine or estuarine
3. (48B=y) or [(1.2=y)+(13A/B/Da=y)]
   salinity=0.5-5.0 ppt or high rainfall-erosivity factor and forested, scrub-shrub or persistent emergent

F

T

MODERATE

ST/RE List B

ALL of the following:

1. (31.4=y)
   Zone sB > Zones oB and C
2. (10D/E/F=y)
   marine, estuarine or tidal riverine
3. (48B=y)
   salinity = 0.5-5.0 ppt

OR ALL of the following:

1. (10C/D=y)
   riverine
2. (35.1=y or 35.2=y)
   expanded flooding or flow
3. [(15.2=y) or (31.4=y)]
   good instream interspersion or Zone sB > Zones oB and C
4. (9.1=y) or (9.2=y) or (31.1=n) or [(49.1.2=y)+(49.1.1=y)]
   constricted outlet or Zones A+B>C or numerous pools/riffles

T

F

LOW

-- End --

Sediment/Toxicant Retention (S/TR) Opportunity Key

For the ST/R Opportunity interpretation use the answers in the "X" column of Form B. If these are not available, use the answers in the "W" column, or as a last resort the answers in the "D" column.

ANY of the following:
1. (55.1=n)
   measured suspended solids not low
2. (25.1=y)
   potential sediment source in buffer zone
3. (25.3=y)
   erosive conditions present
4. (27.1=y)
   toxin source in buffer zone

T → HIGH

F ↓

ALL of S/TR List A

T → MODERATE

F ↓

BOTH of the following
1. (8.1=y)
   permanent inlet present
2. ANY of S/TR List A

T → MODERATE

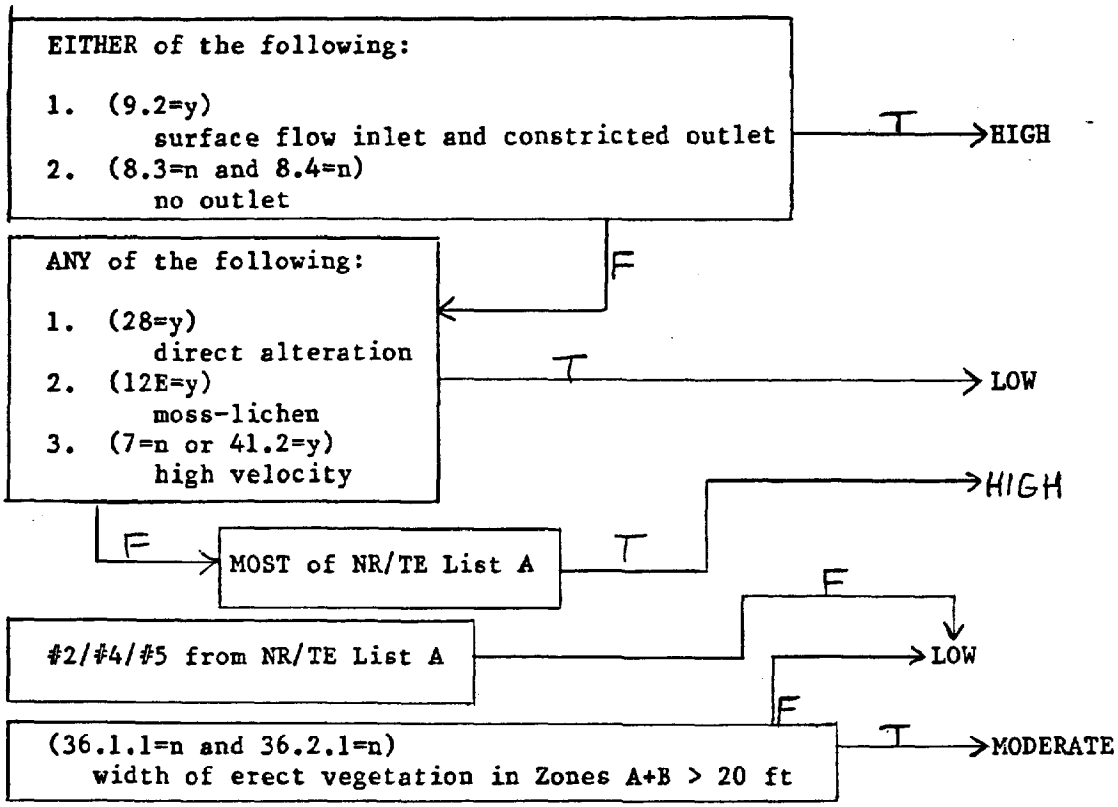
F → LOW

<u>S/TR List A</u>:
1. [(21A=n) or (1.2=y)]
   subwatershed not forest and scrub or high rainfall-erosivity factor
2. (5.1.1=y)
   wetland comprises <5% of watershed
3. [(5.2=n)+(34.2=n)]
   upslope wetlands comprise <5% of watershed and water table not influenced by upslope impoundment

— End —

Nutrient Removal/Transformation (NT/R) Effectiveness Key

For the NR/T Effectiveness interpretation use the answers in the "X" column of Form B. If these are not available, use the answers in the "W" column, or as a last resort the answers in the "D" column.



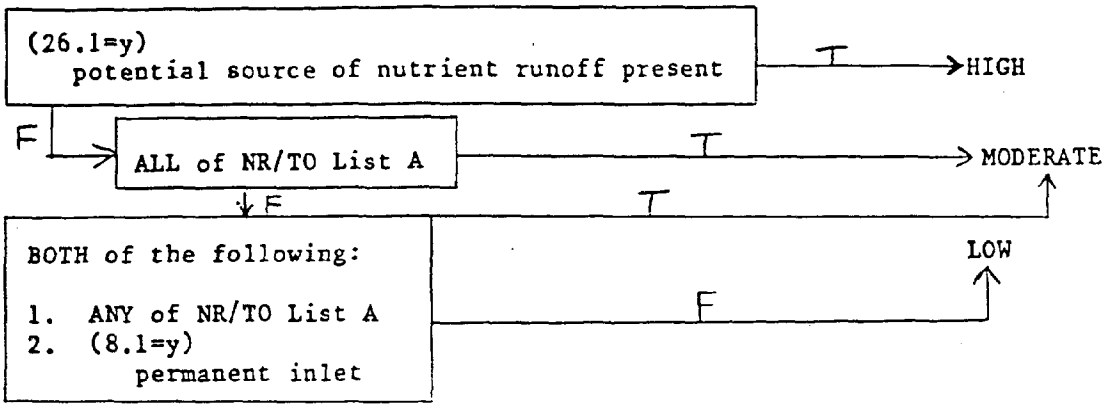
NR/TE List A:

1. [(7=y) or (41.1=y) or (12A/B/Cb/Da=y)]
   low velocity throughout or forested/scrub-shrub, floating vascular aquatic bed or persistent emergent
2. [(24.1=y or 24.2=y) and (56.1=n)]
   fine mineral soils present and alkalinity not low
3. [(12Aa+Ba=n) and (23=n) and (17=y)]
   no dead forest and scrub-shrub and no ditches, levees, or channels to confine water and high plant diversity
4. [(36.1.2=y)+(26.2=y)] OR
   [(36.2.3=y)+(26.3=y)+(9.1=y or 9.2=y)+(7=y or 41.1=y)]
   extensive erect vegetation in Zones A and B and sheet flow is major nutrient source OR extensive eB width in shallow water and channel flow is major nutrient source and constricted outlet and low velocity
5. (33A/E/J/K=y)
   most permanent hydroperiod is permanently flooded, saturated, or irregularly exposed/flooded tidal

-- End --

Nutrient Removal/Transformation (NT/R) Opportunity Key

For the NR/T Opportunity interpretation use the answers in the "X" column of Form B. If these are not available, use the answers in the "W" column, or as a last resort the answers in the "D" column.



NR/TO List A:

1. [(1.2=y) or (21A=n)]
   high rainfall-erosivity factor or forest and scrub watershed
2. [(5.1.1=y) or (4.2C/D=y)]
   AA comprises <5% of watershed or riverine watershed >100 square miles
3. (5.2=n)
   upslope wetlands comprise <5% of watershed acreage

-- End --

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