

INDIAN AND HOWARDS CREEK LWP AREA WETLAND ASSESSMENT STUDY PLAN

NC Division of Water Quality, Wetlands and Stormwater Branch, Program Development Unit
Watershed Assessment Team

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Background

The Ecosystem Enhancement Program (EEP) has selected the Indian Creek (hydrologic unit [HU] 050010), Howard's Creek (HU 040040), and the Middle South Fork Catawba River (HU 040030) watersheds in catalog unit 03050102 near Cherryville (Gaston Co.) and Lincolnton (Lincoln Co.) for the development of a local watershed plan (LWP). Two of the objectives of the LWP are to characterize the current level of water quality function within the selected watershed, and identify possible enhancement projects that will not only meet the compensatory mitigation needs within the HU but will also provide functional uplift for the watershed.

As part of the LWP development, EEP contracts with the NC Division of Water Quality (DWQ) to have the Watershed Assessment Team (WAT) perform water quality studies within the LWP area. In the past, these studies have primarily been focused on in-stream assessments. However, EEP has a great need for wetland compensatory mitigation sites in the Indian/Howards Creek HUs. Coincidentally, a new tool for jurisdictional (i.e., meets the US Army Corps of Engineers definition) wetland functional assessments has recently been finalized after four years of work by an interagency (federal and state) team. This method is the NC Wetland Assessment Method, or NC WAM (NC Wetland Functional Assessment Team, 2008). The NC WAM provides a qualitative rating (low, medium, or high) for: 1) the wetland as a whole, 2) the three major functions of wetlands (hydrology, water quality, and habitat), and 3) eleven sub-functions. All of these assessments are made as a comparison to reference conditions for the type of wetland being assessed. It is a rapid observational method, designed to be completed within 15 minutes in the field once the site has been examined, the wetland type identified, and the area delineated.

The NC WAM will have regulatory implications beginning in the fall of 2008, in that mitigation credits could be earned by raising the level of functioning of a wetland. The net result will be that many more sites will become economically feasible for EEP (and others providing compensatory mitigation) to pursue as potential mitigation sites. Given the need for wetland mitigation in the Indian/Howards Creek LWP area, it is believed that having the NC WAM ratings available for wetlands in the area will provide EEP with a much larger pool of possible project sites. Also, this survey will hopefully provide an indication of the general condition of wetlands within the LWP area as a whole and how they affect watershed condition in general.

This study plan outlines the design and methods to be used to carry out the wetland assessments within the Indian/Howards Creek LWP area. More information on the watershed and the instream water quality studies to be conducted are available in NC DENR-DWQ, 2008a and NC DENR-DWQ, 2008b.

Study Design

Objectives

The objectives of this study are:

- To identify 30-35 jurisdictional wetlands within the Indian/Howards Creek LWP area and assess the current functional level for each using NC WAM;
- To calculate restoration equivalents based on potential for enhancement at each of the assessed jurisdictional wetlands, where appropriate;
- To characterize the level of functioning of wetlands as a whole throughout the LWP area by using a stratified random sampling design.

This information should be useful to EEP for identification of potential mitigation sites and to identify trends within the watershed.

Study schedule

July 1, 2008	Site selection completed. Prospective sites provided to EEP for obtaining landowner permission for access.
July 31, 2008	EEP notifies WAT of any sites where landowner access has been denied.
August 2, 2008	Site list finalized
August 4-15, 2008	Field assessments performed
September 15, 2008 (approximate)	Draft report distributed for internal DWQ review
October 15, 2008	Final report and deliverables to EEP

Site selection

Potential wetland sites were identified remotely using GIS based on the best available data, including the National Wetland Inventory (NWI), county soil surveys, contours, USGS topographic maps, and infrared aerial photography. The main data source used was the NWI, though this data set tends to highly overestimate jurisdictional wetlands in the piedmont ecoregion. It was cross-referenced with the soils data, and each of the sites with hydric soils were further examined using IR aeriels and contours using best professional judgment to determine the relative likelihood of the presence of a jurisdictional wetland on the site. Criteria included the presence of appropriate vegetation types and/or wetness/ponding on the aerial photography, the likelihood of it being an unmapped stream, and low-slope areas, especially adjacent to streams. Additionally, areas of isolated hydric soils (i.e., surrounded by non-hydric soils) were examined using these same criteria to determine if they may be possible wetland candidates. NWI and other features were edited as needed to include only promising areas, and their areas calculated using ArcGIS.

This method of remote identification of wetlands has generally been found to be about 50% accurate in past experience, therefore the total number of candidates needed to find 30-35 jurisdictional wetlands would be 60-70. Additionally, landowner permission will be needed to access the sites, which has generally resulted in about a 20% refusal rate in the experience of

EEP staff (Herrmann, personal communication, June 2008). Therefore, the total number of potential sites needed was set at 80.

The GIS analysis resulted in approximately 130 possible candidates. Since size is an important consideration to EEP in determining the economic feasibility of a possible mitigation site, the distributions of the candidate site acreages were examined (Figure 1). Half of the sites were above the minimum size (3.0 acres) specified by EEP; this was also approximately the median area for all sites. However, in order to characterize the watershed as a whole as well as to capture wetland types that are generally small, smaller sites must also be examined, though a lower threshold of 0.25 acres was used to eliminate three very small sites. The final stratification of the candidate sites for random sampling was based on size: 40 sites were selected that were >3.0 acres, and 40 sites were selected that were ≤3.0 acres. Random sampling was performed using SAS JMP v.7.0. A map of the 80 randomly chosen sites is shown in Fig. 2 and a list is included as Appendix 1.

The final list of 80 sites will be provided to EEP as an ArcGIS shapefile. EEP, in conjunction with local organizations (such as the Cooperative Extension Service), will identify landowners, obtain permission for DWQ to access the property for field assessments in August, and notify WAT staff of sites where landowners have denied access.

Site visits will take place August 4-8 and August 11-15. It is anticipated that due to denial of access by landowners and other access issues discovered in the field, approximately 60 sites will be visited.

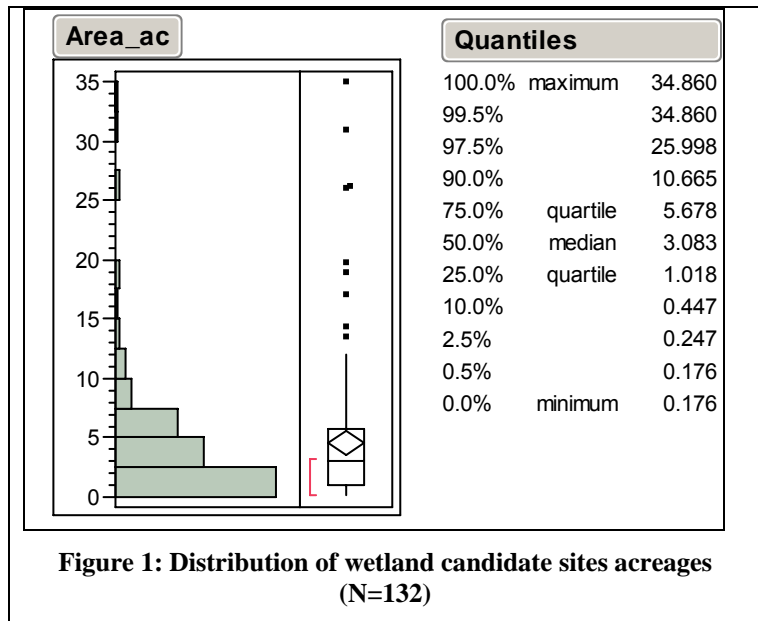


Figure 1: Distribution of wetland candidate sites acreages (N=132)

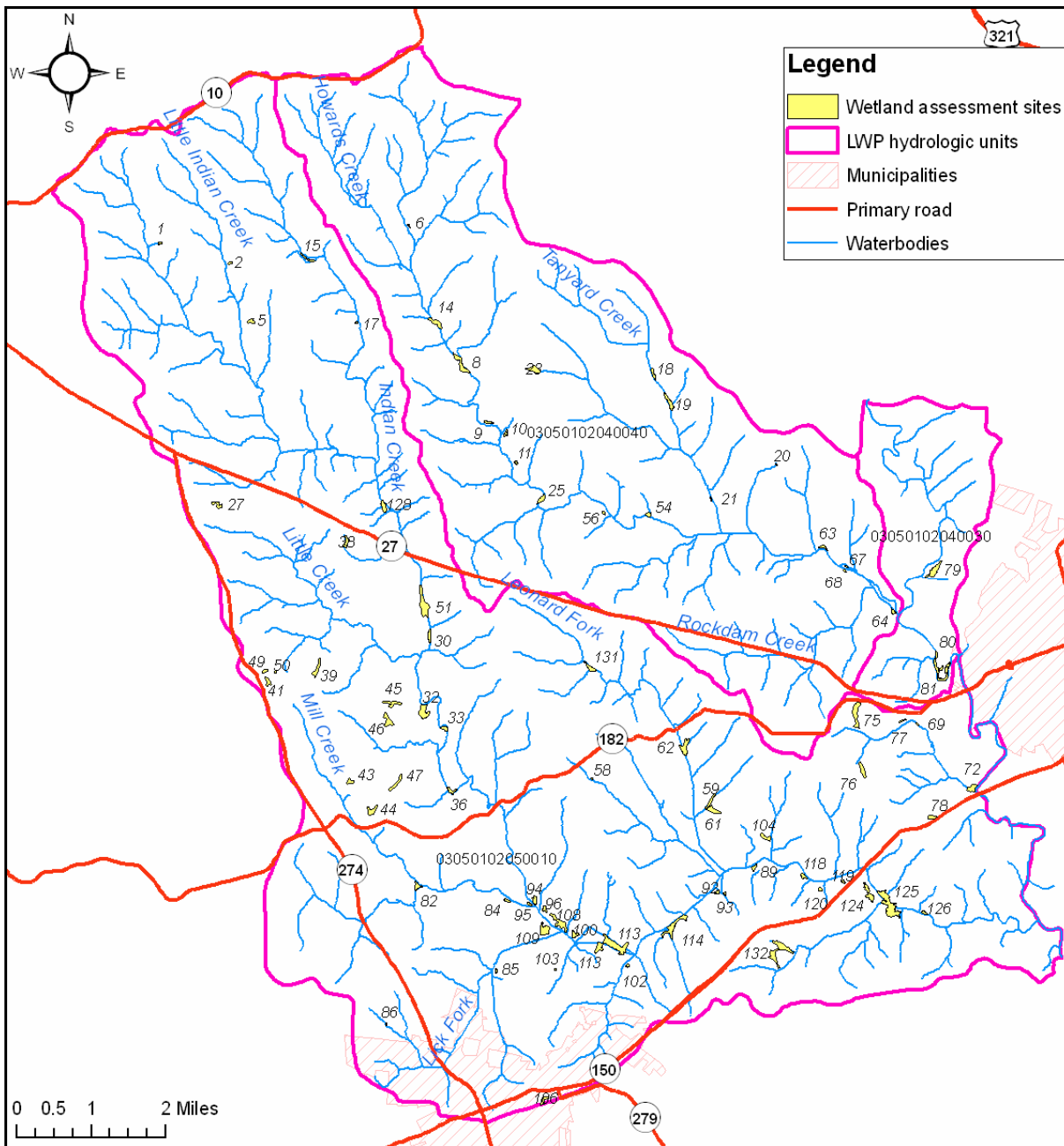


Figure 2: Location of randomly selected wetland candidate sites

Field methods

Candidate sites will be visited and walked to determine if any wetland(s) exist at the site. If wetlands are thought to be present, their extent will be determined if they are jurisdictional using the US Army Corps of Engineers’ (USACE) methodology (USACE, 1987). Only sites found to be jurisdictional will undergo further assessment, as NC WAM is only applicable to jurisdictional wetlands; that is, they have evidence of all three criteria required by the USACE methodology: wetland hydrology, hydric soils, and wetland vegetation. If the wetlands are determined to be jurisdictional, a rough delineation of the boundary will be performed and

recorded using a Trimble GeoXT. The wetland type will be identified using the latest version of the Dichotomous Key to General North Carolina Wetland Types (NC WFAT, 2008; Appendix 3). Finally, functional assessment will be performed using the NC Wetland Assessment Method (NC WAM) (NC WFAT, 2008; Appendix 2). If enhancement opportunities exist at a specific site, an additional NC WAM assessment will be performed based on anticipated conditions post-enhancement; this will provide potential functional uplift for calculation of possible restoration equivalents. Once back in the office, results from NC WAM will be entered into the NC WAM calculator, which will provide the final ratings. These final ratings will then be warehoused electronically and associated with their corresponding GIS features.

Calculation of Restoration Equivalents

For assessed wetland sites that have potential for enhancement, restoration equivalents will be calculated based on potential functional uplift using the draft/proposed mitigation ratio policy based on NC WAM ratings. The specifics of the policy are still under development by an Interagency Team at this time.

Data analysis and reporting

It is anticipated that minimal data analysis will be attempted beyond the calculation of functional ratings using the NC WAM calculator, though simple descriptive statistics (such as distribution of types of wetlands, number of wetlands showing each functional rating, etc.) will be provided, likely grouped by HU. Since this type of data has not previously been collected, it is not currently known if results from NC WAM will be appropriate for further analysis for spatial trends, etc. A statistician is being consulted at the time of writing to assist with these questions.

The primary deliverables that will be provided to EEP at the end of the project will be:

- An ArcGIS shapefile of the assessed wetlands and their ratings;
- Electronic versions of NC WAM results for each site;
- Digital photos;
- Written report summarizing findings, including, as appropriate, descriptions of mitigation opportunities and calculated restoration equivalents based on potential functional uplift for each assessed site;
- A presentation of results to the Indian and Howards Creeks stakeholders group.

Ancillary to these products, WAT staff will also keep track of sites that did not meet the site criteria for this study but may be worth further examination by EEP as possible mitigation/enhancement sites. For example, some sites may be mapped with hydric soils and appear visibly wet on aerial photography, but may be currently used as pasture or hayfield, and replanting with wetland vegetation may enhance these sites. It is anticipated that information about these sites will be provided to the EEP Planner throughout the study, preferably in a GIS-compatible format.

References

NC Wetland Functional Assessment Team (WFAT). 2008. N.C. Wetland Assessment Method (NC WAM) User Manual.

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Appendix 1: Potential Wetland Assessment Sites

The sites listed below are the randomly selected features (“wetland candidate sites”) to be assessed with the NC Wetlands Assessment Method (NC WAM) if found to contain jurisdictional wetlands.

- SiteID: Corresponds to label in map (Figure 2 of the main text). This will be the unique identifier for the polygon throughout the project.
- NWI Type: The wetland type specified in the original National Wetlands Inventory data set. A key to the abbreviations and descriptions of the types are available at <http://www.fws.gov/nwi/>.
- Comment: Notes made during screening of polygons in GIS. HydricA, HydricB, and soil types (e.g., ChA, WoA) were obtained from the USDA county soil surveys via a GIS shapefile. See the appropriate soil survey for descriptions.
- Area: Acreage of polygon as calculated in GIS.
- HU Code: Hydrologic Unit Code (all sites are located in Cataloging Unit 03050102).
- USGS name: Name of the USGS topographic map where the site is located.
- USGS Quadrant: Quadrant of the USGS map where the site is located (NW, NE, SW, or SE)

SiteID	NWI Type	Comment	Area (acres)	HU Code	USGS name	USGS Quadrant
1	PUBHh	HydricB (ChA) on interstream divide, maybe check w/smaller contours	1.0	050010	Banoak	SW
2	PUBHh		1.0	050010	Banoak	SW
5		HydricA (WoA) surrounded by non-hydric soil	2.9	050010	Banoak	SW
6	PEM1A	HydricB soil, near stream in floodplain, but looks questionable.	0.5	040040	Banoak	SE
8	PFO1A	Along stream, flat area, HydricB (ChA) soils	10.0	040040	Banoak	SE
9	PFO1A	HydricB (ChA), along stream	2.0	040040	Banoak	SE
10	PFO1A	HydricB (ChA), along stream	1.7	040040	Banoak	SE
11	PSS1A		1.0	040040	Banoak	SE
14		Hydric soils (ChA) along Howards Cr. (New feature combines 2 contig on NWI)	6.7	040040	Banoak	SE
15	PSS1B	HydricB (ChA) on interstream divide	2.6	050010	Banoak	SE
17	PUBHh	May be pond	0.4	050010	Banoak	SE
18	PFO1A		2.7	040040	Reepsville	SW
19	PFO1A		6.0	040040	Reepsville	SW
20	PUBHh	Upstream of hydricA, can't tell if it's a small pond?? Definitely wet on IR	0.3	040040	Reepsville	SW
21	PSS1A		0.5	040040	Reepsville	SW
23		HydricA (WoA) surrounded by non-hydric soil but at top of blue line stream	6.6	040040	Reepsville	SW
25		Hydric soils along stream, also includes small depressional area (SW part of feature)	4.0	040040	Reepsville	SW
27		HydricB (HeB) surrounded by non-hydric	3.9	050010	Cherryville	NW
30	PFO1A	Hydric (ChA) soils along Indian Cr	3.4	050010	Cherryville	NE
32	PFO1A	HydricB soils, but flat area near stream, looks very promising	11.1	050010	Cherryville	NE

SiteID	NWI Type	Comment	Area (acres)	HU Code	USGS name	USGS Quadrant
33	PFO1A	HydricB soils, next to river, but questionable	2.7	050010	Cherryville	NE
36	PFO1A	HydricB (ChA) soils along Indian Cr	3.4	050010	Cherryville	NE
38		Hydric (WoA) inclusion in upland, between two ponds	4.6	050010	Cherryville	NE
39		Upland HydricA (WoA) inclusion	6.0	050010	Cherryville	NE
41		Upland HydricB (HeB) inclusion	3.4	050010	Cherryville	NE
43		HydricA (WoA) surrounded by non-hydric	3.2	050010	Cherryville	NE
44		HydricB (HeB) inclusion	5.9	050010	Cherryville	NE
45		HydricA (WoA) surrounded by non-hydric	6.2	050010	Cherryville	NE
46		HydricA (WoA) surrounded by non-hydric	7.6	050010	Cherryville	NE
47		HydricB (HeB) surrounded by non-hydric	5.9	050010	Cherryville	NE
49		WL found during site visits 6/17	1.7	050010	Cherryville	NE
50		WL found during site visits 6/17	0.5	050010	Cherryville	NE
51		New feature combining 3 NWI features; hydric soils along Indian Cr	17.1	050010	Cherryville	NE
54		HydricB soils at confluence of Howards Cr and UT	2.4	040040	Lincolnton W	NW
56		Site visit 6/17 confirm small low quality WL	0.9	040040	Lincolnton W	NW
58	PUSCh	Low priority- maybe emergent WL at head of HW pond (194)	0.5	050010	Lincolnton W	NW
59	PSS1A	HydricB (ChA) along stream	4.0	050010	Lincolnton W	NW
61		HydricB (HeB) soils, likely just unmapped stream	6.1	050010	Lincolnton W	NW
62		New feature combining 2 contiguous from NWI	8.8	050010	Lincolnton W	NW
63	PFO1A	Looks like it may be part of a large WL complex along both sides of Howards Cr	2.0	040040	Lincolnton W	NE
64	PSS1A	On floodplain, hydricB (ChA) soils	1.8	040040	Lincolnton W	NE
67		Hydric soils in floodplain, promising on IR, poss part of larger complex along Howards Cr	0.4	040040	Lincolnton W	NE
68		Hydric soils in floodplain, promising on IR, poss part of large wetland complex along Howards Cr	0.7	040040	Lincolnton W	NE
69	PUBHh	Likely just impounded due to road but may be worth a look	0.4	050010	Lincolnton W	NE
72	PFO1A	Hydric soils (ChA) in floodplain	5.6	050010	Lincolnton W	NE
75		HydricA (WoA) near Hord Cr, likely just unmapped stream	12.2	050010	Lincolnton W	NE
76		HydricA (WoA) though likely unmapped stream	5.5	050010	Lincolnton W	NE
77		HydricA (WoA) upslope from stream	1.1	050010	Lincolnton W	NE
78		HydricA (WoA) surrounded by non-hydric	3.0	050010	Lincolnton W	NE
79	PFO1/3B	May be a large WL complex- NWI boundaries may underestimate it	9.7	040030	Lincolnton W	NE
80	PFO1A	Large area, only eastern piece looks promising	13.6	040030	Lincolnton W	NE
81		Wet on IR, FvA soils, subset of 154	1.8	040030	Lincolnton W	NE
82	PEM1A	HydricB (ChA) soils, at the confluence of Mill Cr and other crk	3.7	050010	Cherryville	SE
84	PSS1F	HydricB on floodplain of Mill Cr	1.5	050010	Cherryville	SE
85	PFO1A	Marginal, hydricB (CH) soils	1.0	050010	Cherryville	SE
86	PFO1C	V marginal-- barely overlaps CH along Lick Fk	0.3	050010	Cherryville	SE
89	PSS1A	HydricB (ChA and FvA) on floodplain along Indian Cr; several others nearby	2.2	050010	Lincolnton W	SW

SiteID	NWI Type	Comment	Area (acres)	HU Code	USGS name	USGS Quadrant
92	PFO1A	Hydric soil, along stream/floodplain	1.5	050010	Lincolnnton W	SW
93	PUBHh	Hydric soil, along stream, maybe pond, maybe WL on IR	0.6	050010	Lincolnnton W	SW
94	PFO1A	HydricB soils, floodplain of Indian Cr and trib	3.3	050010	Lincolnnton W	SW
95	PFO1A	HydricB soils (ChA), at confluence of Indian and Mill Cr	1.3	050010	Lincolnnton W	SW
96	PSS1A	HydricB soils, promising on IR	2.1	050010	Lincolnnton W	SW
100	PSS1A	see 301; union to new feature	3.5	050010	Lincolnnton W	SW
102	PFO1C	HydricB (CH) on sm plateau next to stream; looks wet on IR	1.0	050010	Lincolnnton W	SW
103	PUBHh	Marginal, hydricB (HeB) soils	0.4	050010	Lincolnnton W	SW
104		HydricA inclusion coming off river, likely unmapped trib	3.6	050010	Lincolnnton W	SW
106		HydricB (HeB) surrounded by non-hydric soil--interesting, possible urban WL?	3.2	050010	Lincolnnton W	SW
108		Union of 2 contiguous NWI features	11.3	050010	Lincolnnton W	SW
109		Union of 2 contiguous NWI features	9.0	050010	Lincolnnton W	SW
113		Union of 6 NWI features	26.3	050010	Lincolnnton W	SW
114		Union of 2 NWI features	14.3	050010	Lincolnnton W	SW
118	PFO1A	HydricB (ChA) along Indian Cr, definitely wet on IR, WL found on site visit 6/16	2.3	050010	Lincolnnton W	SE
119	PFO1C	HydricB (ChA, HeB) in floodplain, small low quality WL found on site visit 6/16	1.0	050010	Lincolnnton W	SE
120	PSS1A	HydricB (ChA, HeB) on floodplain of Indian Cr; near promising complex (see 254)	1.2	050010	Lincolnnton W	SE
124		Union of 2 NWI features	8.2	050010	Lincolnnton W	SE
125		Union of 4 NWI features	26.2	050010	Lincolnnton W	SE
126		Union of 2 NWI Features	1.5	050010	Lincolnnton W	SE
128	PSS1A	On floodplain, Hydric B soils	5.0	050010	Lincolnnton W	SE
131			4.6	050010	Lincolnnton W	NW
132		Clip of large NWI feature-- ditched areas excluded	19.1	050010	Lincolnnton W	SE

Appendix 2: NC Wetland Assessment Method Forms

NC WAM FIELD ASSESSMENT FORM

VERSION 1 (June 12, 2008)

Wetland Site Name _____ Wetland Type _____ Level III Ecoregion _____ River Basin _____ <input type="checkbox"/> Yes <input type="checkbox"/> No Precipitation within 48 hrs?	Date _____ Assessor Name/Organization _____ Nearest Named Water Body _____ USGS 8-Digit Catalogue Unit _____ Latitude/Longitude (deci-degrees) _____
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Evidence of stressors affecting the assessment area (may not be within the assessment area)

Please circle and/or make note below if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? Yes No

Describe effects of stressors that are present.

Regulatory Considerations

Select all that apply to the assessment area.

- Anadromous fish
- Federally protected species or State endangered or threatened species
- NCDWQ riparian buffer rule in effect
- Wetland adjacent to Primary Nursery Area or associated with a stream that drains to a Primary Nursery Area
- Publicly owned property
- N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- N.C. Division of Water Quality best usage classification of SA or supplemental classifications of HQW, ORW, or Trout
- Designated NCNHP reference community
- Wetland adjacent to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (Check all that apply)

- Blackwater
- Brownwater
- Tidal (if tidal, check one of the following boxes) Lunar Wind Both

Is the assessment area on a coastal island? Yes No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? Yes No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of alteration.

- | | | |
|----------------------------|----------------------------|---|
| GS | VS | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | Not severely altered |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], artificial hydrologic alteration) |

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

- | | | |
|----------------------------|----------------------------|--|
| Surf | Sub | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | Water storage capacity and duration are not altered. |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation). |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, stream incision, underground utility lines, soil compaction). |

3. Water Storage/Surface Relief – assessment area/wetland type condition metric

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

- | | | |
|----------------------------|----------------------------|--|
| AA | WT | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | Majority of the wetland type with depressions able to pond water > 2 feet deep |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Majority of the wetland type with depressions able to pond water 1 to 2 feet deep |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Majority of wetland type with depressions able to pond water 6 inches to 1 foot deep |
| <input type="checkbox"/> D | <input type="checkbox"/> D | Majority of wetland type with depressions able to pond water 3- to 6-inches deep |
| <input type="checkbox"/> E | <input type="checkbox"/> E | Depressions able to pond water < 3-inches deep |

4. Soil Texture/Structure – assessment area condition metric

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

- A Sandy soil
- B Predominantly characterized by mottled (redoxymorphic features), mineral soil
- C Predominantly characterized by other, mineral soil (no mottling)
- D Gleyed mineral soil
- E Peat or muck soil (histosol or histic epipedon)
- A Soil ribbon < 1 inch
- B Soil ribbon ≥ 1 inch
- A No peat or muck presence
- B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

- | | | |
|----------------------------|----------------------------|---|
| Surf | Sub | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | Little or no evidence of pollutants or discharges entering the assessment area |
| <input type="checkbox"/> B | <input type="checkbox"/> B | Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area |
| <input type="checkbox"/> C | <input type="checkbox"/> C | Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor) |

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

- | | | | |
|----------------------------|----------------------------|----------------------------|--|
| WS | 5M | 2M | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | <input type="checkbox"/> A | > 30% impervious surfaces with stormwater Best Management Practices (BMPs) (land use examples: industrial, commercial, and high-density residential) |
| <input type="checkbox"/> B | <input type="checkbox"/> B | <input type="checkbox"/> B | > 30% impervious surfaces without stormwater BMPs |
| <input type="checkbox"/> C | <input type="checkbox"/> C | <input type="checkbox"/> C | 10 to 30% impervious surfaces |
| <input type="checkbox"/> D | <input type="checkbox"/> D | <input type="checkbox"/> D | < 10% impervious surfaces |
| <input type="checkbox"/> E | <input type="checkbox"/> E | <input type="checkbox"/> E | Old urban development (pink areas on USGS 7.5-minute quadrangles) |
| <input type="checkbox"/> F | <input type="checkbox"/> F | <input type="checkbox"/> F | New adjacent development |
| <input type="checkbox"/> G | <input type="checkbox"/> G | <input type="checkbox"/> G | Confined animal operations (or other local, concentrated source of pollutants) |
| <input type="checkbox"/> H | <input type="checkbox"/> H | <input type="checkbox"/> H | ≥ 20% coverage of pasture without riparian buffer |
| <input type="checkbox"/> I | <input type="checkbox"/> I | <input type="checkbox"/> I | ≥ 20% coverage of pasture with effective riparian buffer |
| <input type="checkbox"/> J | <input type="checkbox"/> J | <input type="checkbox"/> J | ≥ 20% coverage of agricultural land (regularly plowed land) without riparian buffer |
| <input type="checkbox"/> K | <input type="checkbox"/> K | <input type="checkbox"/> K | ≥ 20% coverage of agricultural land (regularly plowed land) with effective riparian buffer |
| <input type="checkbox"/> L | <input type="checkbox"/> L | <input type="checkbox"/> L | ≥ 20% coverage of maintained grass/herb |
| <input type="checkbox"/> M | <input type="checkbox"/> M | <input type="checkbox"/> M | ≥ 20% coverage of silvicultural land with disturbance < 5 years old |
| <input type="checkbox"/> N | <input type="checkbox"/> N | <input type="checkbox"/> N | Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic modifications that prevent drainage or overbank flow from affecting the assessment area. |

7. Wetland Acting as Vegetated Buffer – assessment area condition metric

Is assessment area within 50 feet of a stream or other open water? (open water does not typically include man-made ditches or canals)

- Yes No If No, Skip to next metric

Stream width (Stream width is normal flow width [ordinary high water to ordinary high water]). If the stream is anastomosed, combine widths of channels/braids for a total stream width.

- ≤ 15-foot wide > 15-foot wide Not applicable (no stream associated with assessment area)

Do roots of assessment area vegetation extend into the bank of the adjacent stream/open water?

- Yes No

Is stream or other open water sheltered or exposed?

- Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
 Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland/Riparian Buffer Width – assessment area/wetland type/wetland complex metric

Check a box in each column. Select the appropriate width for the wetland type at the assessment area (WT), the wetland complex (WC), and the riparian buffer at the assessment area (RB) (if applicable). Riparian buffer width is measured from top of bank and need only be present on one side of the water body. The riparian buffer is measured from the outside banks of the outer channels of an anastomosed system. Make buffer judgment based on dominant landscape feature. Record a note if a portion of the buffer has been removed or disturbed.

- | | | | |
|----------------------------|----------------------------|----------------------------|-----------------------|
| WT | WC | RB (if applicable) | |
| <input type="checkbox"/> A | <input type="checkbox"/> A | <input type="checkbox"/> A | ≥ 100 feet |
| <input type="checkbox"/> B | <input type="checkbox"/> B | <input type="checkbox"/> B | From 80 to < 100 feet |
| <input type="checkbox"/> C | <input type="checkbox"/> C | <input type="checkbox"/> C | From 50 to < 80 feet |
| <input type="checkbox"/> D | <input type="checkbox"/> D | <input type="checkbox"/> D | From 40 to < 50 feet |
| <input type="checkbox"/> E | <input type="checkbox"/> E | <input type="checkbox"/> E | From 30 to < 40 feet |
| <input type="checkbox"/> F | <input type="checkbox"/> F | <input type="checkbox"/> F | From 15 to < 30 feet |
| <input type="checkbox"/> G | <input type="checkbox"/> G | <input type="checkbox"/> G | From 5 to < 15 feet |
| <input type="checkbox"/> H | <input type="checkbox"/> H | <input type="checkbox"/> H | < 5 feet |

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- A Evidence of short-duration inundation (< 7 consecutive days)
- B Evidence of saturation, without evidence of inundation
- C Evidence of long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- A Sediment deposition is not excessive, but at approximately natural levels.
- B Sediment deposition is excessive, but not overwhelming the wetland.
- C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the contiguous wetland complex (WC), and the size of the contiguous, forested wetland (FW) (if applicable, see User Manual). Boundaries are formed by uplands, four-lane roads, or urban landscapes. An observed beaver pond forms a boundary if it extends across the entire width of the floodplain. Additionally, other wetland types are considered boundaries for column WT. If assessment area is clear-cut, select "K" for FW column.

WT	WC	FW (if applicable)
<input type="checkbox"/> A	<input type="checkbox"/> A	<input type="checkbox"/> A ≥ 500 acres
<input type="checkbox"/> B	<input type="checkbox"/> B	<input type="checkbox"/> B From 100 to < 500 acres
<input type="checkbox"/> C	<input type="checkbox"/> C	<input type="checkbox"/> C From 50 to < 100 acres
<input type="checkbox"/> D	<input type="checkbox"/> D	<input type="checkbox"/> D From 25 to < 50 acres
<input type="checkbox"/> E	<input type="checkbox"/> E	<input type="checkbox"/> E From 10 to < 25 acres
<input type="checkbox"/> F	<input type="checkbox"/> F	<input type="checkbox"/> F From 5 to < 10 acres
<input type="checkbox"/> G	<input type="checkbox"/> G	<input type="checkbox"/> G From 1 to < 5 acres
<input type="checkbox"/> H	<input type="checkbox"/> H	<input type="checkbox"/> H From 0.5 to < 1 acre
<input type="checkbox"/> I	<input type="checkbox"/> I	<input type="checkbox"/> I From 0.1 to < 0.5 acre
<input type="checkbox"/> J	<input type="checkbox"/> J	<input type="checkbox"/> J From 0.01 to < 0.1 acre
<input type="checkbox"/> K	<input type="checkbox"/> K	<input type="checkbox"/> K < 0.01 acre

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

Check appropriate box(es) (a box may be checked in each column). This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
<input type="checkbox"/> A	<input checked="" type="checkbox"/> A	≥ 500 acres
<input type="checkbox"/> B	<input type="checkbox"/> B	From 100 to < 500 acres
<input type="checkbox"/> C	<input type="checkbox"/> C	From 50 to < 100 acres
<input type="checkbox"/> D	<input type="checkbox"/> D	From 10 to < 50 acres
<input type="checkbox"/> E	<input type="checkbox"/> E	< 10 acres
<input type="checkbox"/> F		Wetland type has a poor or no connection to other natural habitats

Check Yes or No.

- Yes No Does wetland type have a surface hydrology connection to open waters or tidal wetlands? (evaluate for marshes only)
- Yes No Does the assessment area experience overbank or overland flooding during normal rainfall conditions?

14. Edge Effect – wetland type condition metric

Estimate distance from wetland type boundary to artificial edges. Artificial edges include permanent features such as fields, development, two-lane or larger roads (≥ 40-foot wide), utility line corridors wider than a two-lane road, and clear-cuts < 10 years old. Consider the eight main points of the compass.

- A No artificial edge within 150 feet in all directions
- B No artificial edge within 150 feet in four to seven directions
- C An artificial edge occurs within 150 feet in more than four directions or assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- C Vegetation severely altered from reference in composition. Expected strata are unnaturally absent or dominated by exotic species or composed of planted stands of non-characteristic species or inappropriately composed of a single species.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
- B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

Vegetation present

Evaluate percent coverage of vegetation for marshes only

- A ≥ 25% coverage of vegetation
- B < 25% coverage of vegetation

Check a box in each column for each stratum. Evaluate this portion of the metric for non-marsh wetlands. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

AA	WT	
<input type="checkbox"/> A	<input type="checkbox"/> A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
<input type="checkbox"/> B	<input type="checkbox"/> B	Canopy present, but opened more than natural gaps
<input type="checkbox"/> C	<input type="checkbox"/> C	Canopy sparse or absent
<input type="checkbox"/> A	<input type="checkbox"/> A	Dense mid-story/sapling layer
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate density mid-story/sapling layer
<input type="checkbox"/> C	<input type="checkbox"/> C	Mid-story/sapling layer sparse or absent
<input type="checkbox"/> A	<input type="checkbox"/> A	Dense shrub layer
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate density shrub layer
<input type="checkbox"/> C	<input type="checkbox"/> C	Shrub layer sparse or absent
<input type="checkbox"/> A	<input type="checkbox"/> A	Dense herb layer
<input type="checkbox"/> B	<input type="checkbox"/> B	Moderate density herb layer
<input type="checkbox"/> C	<input type="checkbox"/> C	Herb layer sparse or absent

Vegetation absent

18. Snags – wetland type condition metric

- A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
- B Not A

19. Diameter Class Distribution – wetland type condition metric

- A Majority of canopy trees have stems > 6-inches in diameter at breast height (DBH); many large trees (> 12-inches DBH) are present.
- B Majority of canopy trees have stems between 6- and 12-inches DBH, few are > 12-inch DBH.
- C Majority of canopy trees are < 6-inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both man-made and natural debris piles.

- A Large logs (more than one) are visible (> 12-inches in diameter, or large relative to species present and landscape stability).
- B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersed vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.



22. Habitat Uniqueness – wetland type condition metric

- Yes No Has the N.C. Environmental Management Commission classified the assessment area as “Unique Wetlands” (UWL)?”

Notes

NC WAM Wetland Rating Sheet

Wetland Site Name _____ Date of Assessment _____
 Wetland Type _____ Assessor Name/Organization _____

- Presence of stressor affecting assessment area (Y/N) _____
- Notes on Field Assessment Form (Y/N) _____
- Presence of regulatory considerations (Y/N) _____
- Wetland is intensively managed (Y/N) _____
- Wetland may be a high-quality riverine wetland (Y/N) _____
- Assessment area's surface water storage capacity or duration substantially altered by beaver (Y/N) _____
- Assessment area subject to overbank or overland flooding during normal rainfall conditions (Y/N) _____

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	_____
	Sub-surface Storage and Retention	Condition	_____
Water Quality	Pathogen Change	Condition	_____
		Condition/Opportunity	_____
		Opportunity Presence (Y/N)	_____
	Particulate Change	Condition	_____
		Condition/Opportunity	_____
		Opportunity Presence (Y/N)	_____
	Soluble Change	Condition	_____
		Condition/Opportunity	_____
		Opportunity Presence (Y/N)	_____
	Physical Change	Condition	_____
Condition/Opportunity		_____	
Opportunity Presence (Y/N)		_____	
Pollution Change	Condition	_____	
	Condition/Opportunity	_____	
	Opportunity Presence (Y/N)	_____	
Habitat	Physical Structure	Condition	_____
	Landscape Patch Structure	Condition	_____
	Vegetation Composition	Condition	_____
	Uniqueness	Condition	_____

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	_____
Water Quality	Condition	_____
	Condition/Opportunity	_____
	Opportunity Presence (Y/N)	_____
Habitat	Condition	_____

Overall Wetland Rating _____

Appendix 3: Dichotomous Key to General North Carolina Wetland Types

Dichotomous Key to General North Carolina Wetland Types, v8, 4/30/08

Before using this key, the assessor should have read and become familiar with the descriptions of the general wetland types. The assessor should use best professional judgment to verify that the wetland type determined with the use of this key matches the written description.

The following rules should be used to assist the assessor in the selection of the most appropriate general wetland type. Narrative descriptions are also available to assist in this choice (see User Manual Section 3.1). Wetlands with modifications (man-made or natural) should generally be classified as the original, naturally occurring type if this determination can be made. However, if the full range of stable, existing, wetland characteristics (vegetation, hydrology, and soils) better resemble another wetland type because of long-established, permanent alterations, the wetland should be classified as this current, more appropriate type. If there is evidence suggesting the wetland is a type other than the keyed type, the wetland may be classified as the evidenced type. Also, if the wetland does not appear to conform to any of the following general types, the site should be evaluated based on what the assessor believes is the closest wetland type. If the wetland is "intensively managed" or "intensively disturbed," the assessor should note this fact on the field assessment form and then select the most appropriate general wetland type based on the guidance provided above.

- I. Wetland affected by lunar or wind tide, may include woody areas adjacent to tidal marsh
 - A. Wetland affected, at least occasionally, by brackish or salt water
 - i. Dominated by herbaceous vegetation – **Salt/Brackish Marsh**
 - ii. Dominated by woody vegetation – **Estuarine Woody Wetland**
 - B. Wetland primarily affected by freshwater
 - i. Dominated by herbaceous vegetation – **Tidal Freshwater Marsh**
 - ii. Dominated by woody vegetation – **Riverine Swamp Forest**

- II. Wetland not affected by tides
 - A. Not in a geomorphic floodplain and not associated with a natural linear conveyance (such as a topographic crenulation), nor associated with a natural lake greater than or equal to 20 acres in size
 - i. On a side slope – **Seep**
 - ii. On interstream divides or on a coastal island
 1. Flats on interstream divides in Coastal Plain ecoregions
 - a. Dominated by deciduous trees
 - i. Intermittently to seasonally inundated (typically dominated by sweetgum and oaks) – **Hardwood Flat**
 - ii. Seasonally to semi-permanently inundated (typically dominated by cypress, black gum, and oaks) – **Non-Riverine Swamp Forest**
 - b. Dominated by evergreens
 - i. Dominated by dense, waxy shrub species (typically include gallberries, fetterbushes, honeycup, greenbriar); canopy may include pond pine, Atlantic white cedar, and bays – **Pocosin**
 - ii. Not dominated by dense, waxy shrub species
 1. Dominated by long-leaf or pond pine and wire grass – **Pine Savanna**
 2. Dominated by loblolly or slash pines – **Pine Flat**
 2. In depressions surrounded by uplands anywhere in the state (mafic depressions, lime sinks, Carolina bays) or on shorelines of lakes/pond
 - a. Dominated by dense, waxy shrub species (typically include gallberries, fetterbushes, honeycup, greenbriar); canopy may include pond pine, Atlantic white cedar, and bays and not characterized by clay-based soils – **Pocosin**
 - b. Not dominated by dense, waxy shrub species and not characterized by a peat-filled bay – **Small-Basin Wetland**
 - B. In a geomorphic floodplain or associated with a natural linear conveyance (such as a topographic crenulation) or along shorelines of natural water bodies greater than 20 acres or artificial impoundments
 - i. Northern Inner Piedmont or Blue Ridge Mountains ecoregions and dense herbaceous or mixed shrub/herbaceous vegetation with characteristic bog species (see wetland type description), with or without tree canopy; typically long-duration saturation; sphagnum moss commonly present – **Mountain Bog**
 - ii. Anywhere in the state and not Mountain Bog

1. Dominated by herbaceous vegetation. At least semi-permanently inundated or saturated. Includes lacustrine and riverine fringe and beaver ponds with dense herbaceous vegetation; sphagnum moss scarce or absent – **Non-Tidal Freshwater Marsh**
2. Dominated by woody vegetation. Trees may be present on edges or hummocks.
 - a. Localized depression and semi-permanently inundated – **Floodplain Pool**
 - b. Not “a”
 - i. Zero- to 1st-order stream
 1. Diffuse surface flow and groundwater more important than overbank flooding.
 1. Intermittently inundated to seasonally saturated – **Headwater Forest**
 2. Seasonally to semi-permanently inundated – **Riverine Swamp Forest**
 - ii. Second-order or greater stream or associated with the shoreline of waterbodies 20 acres or greater
 1. Intermittently to seasonally inundated for long duration (may be dominated by sweetgum, ash, sycamore, and oaks) – **Bottomland Hardwood Forest**
 2. Seasonally to semi-permanently inundated for very long duration (may be dominated by cypress and blackgums in Coastal Plain and ash, overcup oak, and elms in Piedmont and Mountains) – **Riverine Swamp Forest**