INDIAN AND HOWARD'S CREEKS LOCAL WATERSHED PLANNING AREA
WETLAND ASSESSMENT SUMMARY

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

Revised[1] December 5, 2008

Background

The Ecosystem Enhancement Program (EEP) selected the Indian Cr. (hydrologic unit code [HUC] 050010), Howard's Cr. (HUC 040040), and the Middle South Fork Catawba River (HUC 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 planning area, 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 focused on in-stream assessments. However, EEP has a great need for wetland compensatory mitigation sites in the Indian and Howard's Cr. HUCs. Coincidentally, a new tool for functional assessments of jurisdictional wetlands has recently been finalized, the NC Wetland Assessment Method, or NC WAM (NC WFAT, 2008).

NC WAM provides a qualitative rating (low, medium, or high) for: 1) overall wetland function, 2) three major functions of wetlands (hydrology, water quality, and habitat), and 3) twenty-one sub-functions. It is a rapid observational method, and was 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 also have regulatory implications beginning in early 2009, whereby mitigation credits could be earned by enhancing the functions of an existing jurisdictional wetland. It is likely that this process change will make more sites economically feasible for EEP (and others providing compensatory mitigation) to pursue as potential mitigation sites.

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

Study Objectives

The objectives of this study were:

- To identify and assess a random sample of jurisdictional wetlands within the Indian/Howard's Cr. LWP area;
- 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.

[1] Revised Figure 3; legend incorrect in October 15, 2008 version

Methods

Site selection

An initial target of 30 wetland assessments was set. Previous experience predicted a landowner refusal rate of 20% and an accuracy rate of the remote wetland identification method of approximately 50%. This meant that approximately 80 potential wetland sites needed to be identified in order to find 30 to 35 jurisdictional wetlands (JWL). Remote identification was done with ArcGIS 9.2 using currently available data, including the National Wetland Inventory (NWI), county soil surveys, contours, USGS topographic maps, and 1998 color infrared (CIR) aerial photography. The main data source used was the NWI, though in DWQ staff experience this data set tends to highly overestimate jurisdictional wetlands in the piedmont ecoregion. The NWI was cross-referenced with soils data, and each of the sites that overlapped hydric soils was further examined using CIR and contours. Best professional judgment was then used 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 CIR, the likelihood of it being an unmapped stream based on contours, and presence of low-slope areas. Additionally, areas of isolated hydric soils (i.e., surrounded by non-hydric soils) that were not depicted on the NWI layer were examined using these same criteria to determine if they may be possible wetland candidates. Candidate wetland features were edited as needed to include only promising areas, and their areas calculated using ESRI ArcMap 9.2.

The initial GIS analysis resulted in approximately 130 potential candidate sites, and the final list of 80 candidate sites was compiled by performing a stratified random selection based on size. 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. Half of the 130 sites were above the minimum size (3 ac.) specified by EEP. However, in order to characterize wetlands throughout the watershed and to capture wetland types that are generally small, smaller sites needed to be included. A lower threshold of 0.2 ac. was used, which eliminated 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 ac., and 40 sites were selected that were ≤3.0 ac. Random sampling was performed using SAS JMP v.7.0. The potential field sites were provided to EEP, who contacted landowners for permission to access their property. The full list of sites and their locations can be found in the study plan (NC DENR-DWQ, 2008a).

Assessment methods

Field visits and assessments were conducted over a three-week period in August 2008. Sites were visited to determine if any jurisdictional wetlands (JWLs) were present. Only sites with JWLs underwent any further assessment, as per NC WAM guidance. JWLs show evidence of all three criteria required by the US Army Corps of Engineers' methodology (USACE, 1987): wetland hydrology, hydric soils, and wetland vegetation. Since a lower boundary of 0.2 acres was used in initial site selection, this threshold was used to determine if a site was "mappable". Any JWLs under this size were not delineated or assessed for this study.

Each mappable JWL was field-delineated, and the boundary recorded using a Trimble GeoXT GPS receiver. Wetland type was identified using the latest version of the Dichotomous Key to General North Carolina Wetland Types (NC WFAT, 2008). A functional assessment was performed using the NC Wetland Assessment Method (NC WAM) (NC WFAT, 2008). Each JWL was also assessed using the Ohio Rapid Assessment Method (ORAM) (Appendix 1; Mack, 2001). If enhancement opportunities existed at a specific site, an additional NC WAM assessment was performed based on anticipated conditions post-enhancement, and this information was used for calculation of possible restoration equivalents. Results from NC WAM were entered into the NC WAM calculator to obtain the functional

ratings (low, medium, or high) for up to 26 functions and sub-functions (actual number evaluated is dependent on wetland type), as well as overall rating for the site.

For JWLs that had potential for enhancement, restoration equivalents were calculated based on potential functional uplift using a mitigation ratio policy based on NC WAM ratings being proposed by the NC Div. of Water Quality (Appendix 2).

Results

A total of 67 sites were visited. Of these, 22 had mappable (≥0.2 acre) JWLs, and 29 wetlands were delineated[2] and assessed at these sites (Figure 1, Appendix 2), totaling 43 acres. The remaining 45 sites either had no JWLs or the JWLs were <0.2 acre in size, and so are not included in this summary (though they are included in the site descriptions). For the thirteen sites that were not visited, landowners refused access to five sites, three sites were deemed physically inaccessible by field staff, and five sites were not visited due to lack of staff time.

Figure 1: Locations of assessed wetlands

[2] At some sites, more than one JWL was present. Each one was assessed separately. The first 3 digits of each wetland code used in this report refer to the site number that corresponded to the original GIS feature, and additional letters/numbers were appended to it to provide a unique identifier for each assessed area.

Six wetlands were located in Howard's Cr. watershed and the remaining 23 sites were located in the Indian Cr. watershed. No wetlands were found in the S Fork Catawba watershed. The highest concentrations of wetlands were along lower and middle Indian Cr., and individual sites were also much larger in these two areas. Wetland size varied widely (Figure 2), from 0.2 to 13.9 ac. with a median was 0.5 ac. A total of 42.8 wetland acres was assessed. Six different wetland types were identified (Table 1). Descriptions of each wetland type are available in the NC WAM documentation (NC WFAT, 2008).

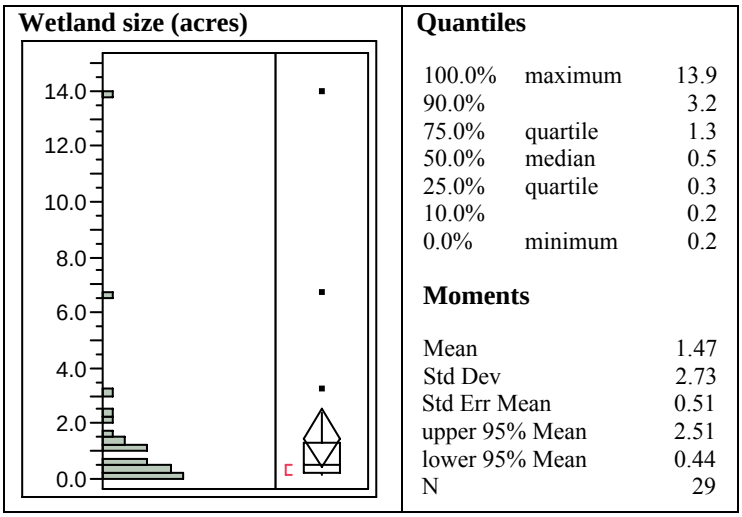


Figure 2: Size distribution of assessed wetlands

Table 1: Wetland types by watershed

Wetland type	*Howard's Cr*	*Indian Cr*	*Total*
Bottomland Hardwood Forest (BLH)	4	8	12
Floodplain Pool (FP)	1	0	1
Headwater Forest (HWF)	0	1	1
Non-tidal Freshwater Marsh (NTFM)	0	2	2
Riverine Swamp Forest (RSF)	1	9	10
Seep	0	3	3
Totals:	***6***	***23***	***29***

Site identification accuracy

Overall, the accuracy rate of remote wetland identification was very low: only 33% of sites visited had mappable JWLs. However, at least 14 sites without JWLs were considered marginal during site visits: they appeared to be wetlands based on vegetation and hydrology indicators but lacked hydric soils, or were simply smaller than the lower threshold of 0.2 acres. The low accuracy rate is in part due to the reliance on outdated or inappropriate data sets (such as NWI, which uses a much broader definition of wetland than the USACE). The DWQ Wetlands/Stormwater Program Development Unit is currently pursuing developing better methodology for remote jurisdictional wetland identification.

Table 2: Accuracy of site identification method by watershed

Watershed	# Random Sites	# Sites Visited	# Sites with JWL	% of Sites with JWLs	Total # of JWLs found
S Fork Catawba	3	3	0	0	0
Howard's Cr	18	17	5	29	6
Indian Cr	59	44	17	39	23

Current condition assessments

The current function of each of the 29 mappable JWLs was assessed using the NC Wetland Assessment Method (NC WAM) and the Ohio Rapid Assessment Method (ORAM). For NC WAM, the majority of wetlands (17, or 59%) rated as highly functioning overall (Fig. 3). Few sites received an overall rating of medium (3, or 10%), and almost a third of sites rated low (9, or 31%). Overall Function showed a similar pattern in the Indian Cr. watershed (HU 050010). Low overall function appeared to dominate in the Howard's Cr. watershed (HU 040040), though this is based on a very small sample size. Distributions by wetland type (Fig. 5) show that the bottomland hardwood forest type seems to show the highest percentage of impaired function: five of the nine wetlands rating low overall were of this type.

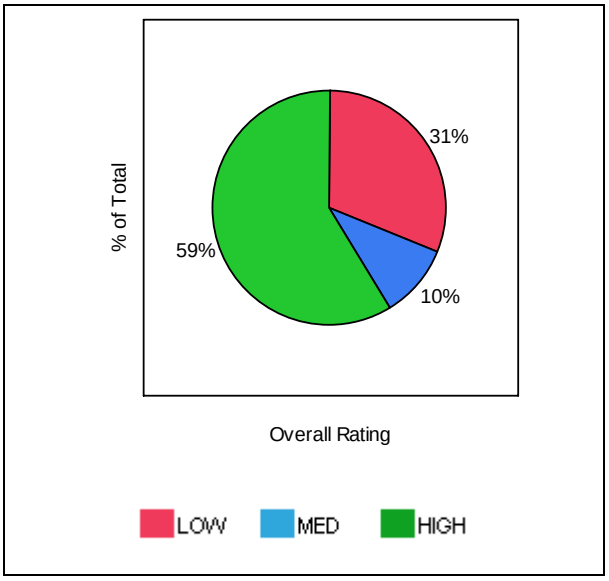


Figure 3: NC WAM Overall Function ratings as a percentage of assessments

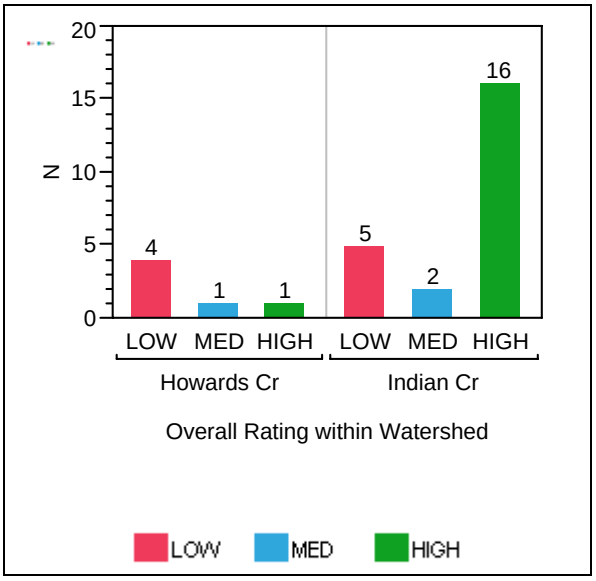


Figure 4: NC WAM Overall Function rating by hydrologic unit code (HUC)

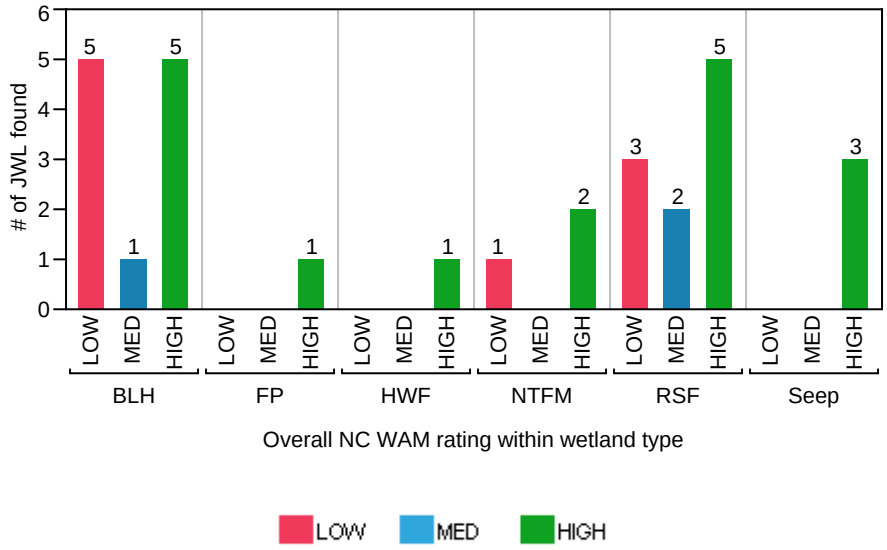


Figure 5: Distributions of NC WAM Overall Function ratings by wetland type

Wetland types: Bottomland Hardwood Forest (BLH), Floodplain Pool (FP), Headwater Forest (HWF), Non-Tidal Freshwater Marsh (NTFM), Riverine Swamp Forest (RSF), and Seep

Ratings for three major functions (Hydrology Overall, Water Quality Condition Overall, and Habitat Overall) were also reviewed (Fig 6a-6c). Habitat ratings were high at almost all sites. As with the Overall Function ratings, the bottomland hardwood forest type seemed to have disproportionately more low scores for each of the three sub-functions.

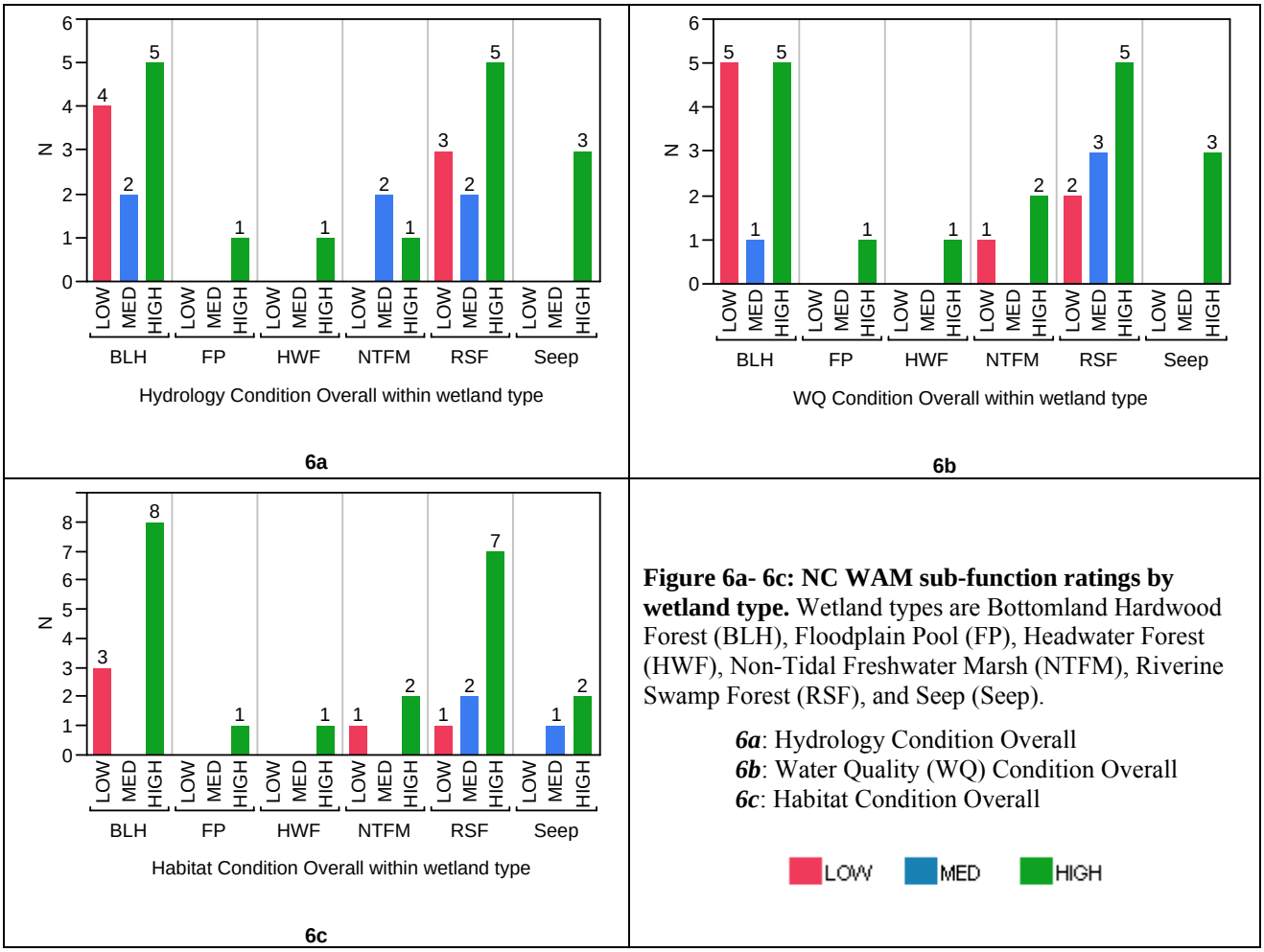


Figure 6a- 6c: NC WAM sub-function ratings by wetland type. Wetland types are Bottomland Hardwood Forest (BLH), Floodplain Pool (FP), Headwater Forest (HWF), Non-Tidal Freshwater Marsh (NTFM), Riverine Swamp Forest (RSF), and Seep (Seep).

6a: Hydrology Condition Overall
6b: Water Quality (WQ) Condition Overall
6c: Habitat Condition Overall

LOW MED HIGH

The Ohio Rapid Assessment Method (ORAM) was also performed at each wetland using the short field form (Appendix 1) as part of an in-house methods comparison study. ORAM is also a rapid visual assessment but it only reflects current condition (such as level of disturbance, habitat, or size). It is not necessarily comparable to the functional assessment compared to a reference wetland type that NC WAM provides. ORAM provides a numerical score ranging from 0-90 (Metric 5 was omitted as it referenced Ohio-specific wetland types). Distributions of the total scores are shown in Fig. 7. Comparing NC WAM Overall Function ratings to ORAM Total Scores (Fig. 8) showed no obvious relationship between the two.

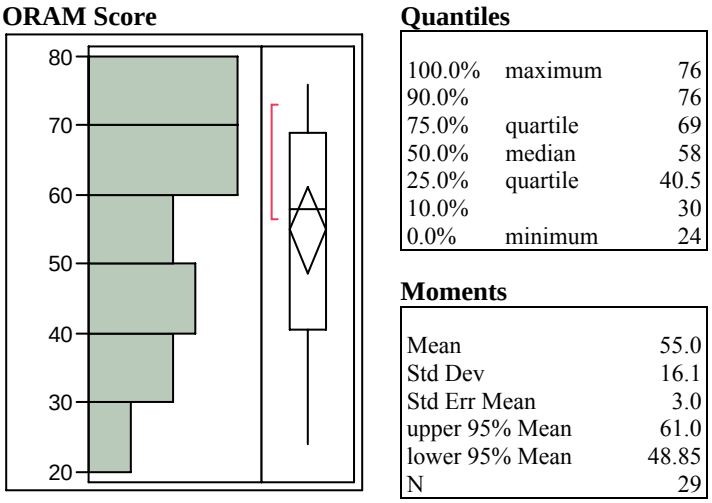
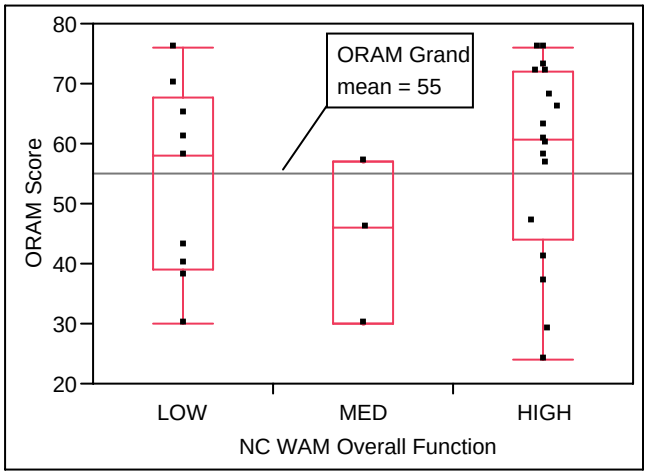


Figure 7: Distributions of Total ORAM Scores



Quantiles

NCWAM Score	ORAM Minimum	ORAM 10%	ORAM 25%	ORAM Median	ORAM 75%	ORAM 90%	ORAM Maximum
LOW	30	30	39	58	68	76	76
MED	30	30	30	46	57	57	57
HIGH	24	28	44	61	72	76	76

Figure 8: NC WAM Overall Function vs Total ORAM Score

Common stressors

Most of the high functioning wetlands assessed were in relatively undisturbed or forested areas, with the exception of one site that was located in downtown Cherryville (site 102). Sites rating medium or low were most often impacted by old/relic ditches, past stream relocations, and the presence of livestock. Two sites (051 and 125a) had been recently logged. Ditching and stream relocations primarily affected the hydrology function. Livestock access (depending on the intensity of grazing, extent of soil compaction, and amount of manure present) could affect all three main functions (habitat, hydrology, and

water quality). With clearcuts, the most obvious impacts were to the habitat functions, although soil compaction from heavy machinery also affected hydrology.

Another common issue was severe incision and erodible banks in many streams in the area. The loss of connection between streams and floodplains effectively cut off a primary water source for certain wetland types (e.g., bottomland hardwood forests, riverine swamp forests) and minimized the water quality and hydrology benefits that these types could provide. Since water quality functions are also more heavily weighted in determining the overall functional rating, these will be strongly affected as well. Stream incision and resultant lowering of the water table may also have had an impact on wetland presence (and may also be a consideration for wetland mitigation/creation in the area) and therefore possibly accounts for at least some of the low accuracy seen in site identification. At several sites where JWLs were not found (or if found, they were very small) it appeared that if overbank flooding had been present, a wetland would likely have developed but nearby streams were too incised.

Figure 9: Example of incision on small stream (note truck bed for scale)

Enhancement opportunities

Enhancement opportunities were noted at ten wetlands. At these locations, NC WAM assessments were repeated based on the anticipated conditions of the site five years post-enhancement (Table 3). When NC WAM ratings were calculated, only six sites showed improvements in overall functional rating. The others remained the same, or in one case actually decreased[3]. A total of 3.9 ac. of wetland were evaluated for enhancement using a proposed enhancement credit policy (Appendix 2). These enhancements could potentially result in 2.45 ac. of restoration equivalents. The most promising sites for enhancement were wetland codes 006a and 006b; 051; 056; and 063. Site 119 was not considered promising for EEP restoration due to its small size (0.2 ac.).

[3] The proposed enhancement at this site (058b) was intended to transition the wetland from a high-rating non-tidal freshwater marsh back to a riverine swamp forest, a wetland type that takes longer than five years to develop. Additionally, this site did not receive overland/overbank flooding.

Table 3: Summary of NC WAM ratings for sites with enhancement opportunities

Site code	Wetland code	Area (ac.)	Wetland type [1]	Recommended enhancement(s)	Current NC WAM rating	Enhanced NC WAM rating	Potential restoration equivalents
6	006a	**0.5**	BLH	Fence out livestock, plant appropriate vegetation	Medium	High	0.25
6	006b	**0.2**	BLH	Fence out livestock, plant appropriate vegetation	Low	Medium	0.05
51	051	**1.0**	NTFM	Replant clearcut area to transition back to BLH [1]	Low	High	0.75
56	056	**0.5**	BLH	Move ditched stream back into wetland or fill	Low	High	0.125
58	058b	0.3	NTFM	Vegetate to transition back to RSF [1]	High	Low	--
63	063	**1.5**	BLH	Fence out livestock, plant appropriate vegetation	Low	High	1.125
119	119	**0.2**	BLH	Fill ditch, some planting of appropriate vegetation	Low	High	0.15
124	124a	0.5	BLH	Fill ditches	Low	Low	--
124	124c2	2.4	RSF	Fence out horses, some planting of appropriate vegetation	Medium	Medium	--
125	125b2	2.0	RSF	Fence out livestock	High	High	--
					Total restoration equivalents		***2.45***

[1] Wetland type: bottomland hardwood forest (BLH), non-tidal freshwater marsh (NTFM), riverine swamp forest (RSF)

Sites 006a and 006b (Fig. 10-11) were located in active pastures on opposite sides of an incised third order unnamed tributary to Howard's Cr. Suggested enhancements included fencing out livestock and re-vegetation, as shrubs and mid-story/sapling layers were sparse at wetland 006a while wetland 006b was entirely herbaceous. Though the combined area of the two wetlands was only 0.7 ac. (and only 0.3 ac. of potential restoration equivalents), the enhancements could possibly be coupled with a stream restoration project.

Figure 10: Wetland 006a

Figure 11: Wetland 006b

Wetland 051 (Fig. 12) was one of two sites that had been recently clearcut. It is currently a non-tidal freshwater marsh but restoring it to bottomland hardwood forest (what the remaining uncut area appears to be) may be possible. NC WAM calculations using predicted post-enhancement conditions were done using both wetland types, and both received overall ratings of high. It should be noted that at the time of writing it has not been determined if restoration credit under the proposed NC WAM-based policy will be given for habitat-only enhancements, particularly at logged sites.

Figure 12: Site 051

Wetland 056 (Fig. 13) was a small (0.5 ac.) bottomland hardwood forest. The stream that at one time flowed through the wetland had been relocated to the edge of the floodplain and is now essentially a ditch. It is anticipated that 056 would greatly benefit from re-routing the stream back through the wetland (possibly gaining some stream restoration credit as well), or the ditch could be filled.

Figure 13: Site 056

Site 063 (Fig. 14) was the site most in need of enhancement. Heavy grazing had resulted in highly altered vegetation, soil compaction, and large amounts of manure on the site. Fencing out cattle, proper site preparation, and vegetation planting would likely increase the overall functional rating at this location to high, potentially providing 1.125 ac. in restoration equivalents.

Figure 14: Site 063

Summary

The survey in the Indian-Howard's Cr. local watershed planning area identified and assessed 29 jurisdictional wetlands ≥0.2 ac. in area at 22 sites. The accuracy of the remote wetland identification method used was relatively low, and the Wetlands/Stormwater Program Development Unit is pursuing revisions to the methodology. Sites were field-delineated and their boundaries recorded using GPS. The Dichotomous Key to NC Wetlands was used to identify the wetland type of each. Six different wetland types were identified, though bottomland hardwood forests and riverine swamp forests were the most common.

The NC Wetland Assessment Method (NC WAM) was used to assess the level of function of each wetland, resulting in a rating of high, medium, or low for Overall Function, as well as up to 26 hydrology, water quality, and habitat sub-functions. Sixty-two percent of wetlands rated high for their overall function, indicating that existing wetlands predominantly are providing valuable hydrology, water quality, and habitat functions within the watershed. Common stressors leading to depressed functional ratings included livestock access, relic ditches and relocated streams, and incised streams that have lost contact with their floodplains.

NC WAM proved problematic for the two most common wetland types (bottomland hardwood forest and riverine swamp forests). As these types by definition must receive regular overland or overbank flooding to provide water quality and hydrology benefits, the presence of this type of inundation is highly weighted in the NC WAM rating calculations. The ratings for four of these sites were adjusted based on best professional judgment, as per NC WAM guidance, since the ratings as-is did not adequately reflect conditions observed in the field.

Enhancement opportunities (generally a combination of re-vegetating, filling ditches or re-directing streams back into the wetlands, and fencing out livestock) were identified at ten sites. However, enhancements were anticipated to lead to functional uplift at only six sites. Of these, only five were recommended for further evaluation for enhancement by EEP: sites 006a, 006b, 051, 056, and 063. Site 063 would likely benefit most and was also the largest of the enhancement sites. The total potential restoration equivalents from these five sites was 2.45 ac. of restoration credit.

Acknowledgments

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Appendix 1: Ohio Rapid Assessment Method for Wetlands v. 5.0, field short form

Full documentation is available at http://www.epa.state.oh.us/dsw/401/oram50um_s.pdf.

ORAM v. 5.0 Field Form Quantitative Rating

Site:	Rater(s):	Date:

Metric 1. Wetland Area (size).

max 6 pts. subtotal

Select one size class and assign score.

- ☐ >50 acres (>20.2ha) (6 pts)
- ☐ 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- ☐ 10 to <25 acres (4 to <10.1ha) (4 pts)
- ☐ 3 to <10 acres (1.2 to <4ha) (3 pts)
- ☐ 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- ☐ 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- ☐ <0.1 acres (0.04ha) (0 pts)

Metric 2. Upland buffers and surrounding land use.

max 14 pts. subtotal

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- ☐ WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- ☐ MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- ☐ NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- ☐ VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- ☐ VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- ☐ LOW. Old field (>10 years), shrubland, young second growth forest. (5)
- ☐ MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- ☐ HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

Metric 3. Hydrology.

max 30 pts. subtotal

3a. Sources of Water. Score all that apply.

- ☐ High pH groundwater (5)
- ☐ Other groundwater (3)
- ☐ Precipitation (1)
- ☐ Seasonal/Intermittent surface water (3)
- ☐ Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- ☐ 100 year floodplain (1)
- ☐ Between stream/lake and other human use (1)
- ☐ Part of wetland/upland (e.g. forest), complex (1)
- ☐ Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- ☐ >0.7 (27.6in) (3)
- ☐ 0.4 to 0.7m (15.7 to 27.6in) (2)
- ☐ <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- ☐ Semi- to permanently inundated/saturated (4)
- ☐ Regularly inundated/saturated (3)
- ☐ Seasonally inundated (2)
- ☐ Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- ☐ None or none apparent (12)
- ☐ Recovered (7)
- ☐ Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed

- ☐ ditch
- ☐ tile
- ☐ dike
- ☐ weir
- ☐ stormwater input
- ☐ point source (nonstormwater)
- ☐ filling/grading
- ☐ road bed/RR track
- ☐ dredging
- ☐ other_____

Metric 4. Habitat Alteration and Development.

max 20 pts. subtotal

4a. Substrate disturbance. Score one or double check and average.

- ☐ None or none apparent (4)
- ☐ Recovered (3)
- ☐ Recovering (2)
- ☐ Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- ☐ Excellent (7)
- ☐ Very good (6)
- ☐ Good (5)
- ☐ Moderately good (4)
- ☐ Fair (3)
- ☐ Poor to fair (2)
- ☐ Poor (1)

4c. Habitat alteration. Score one or double check and average.

- ☐ None or none apparent (9)
- ☐ Recovered (6)
- ☐ Recovering (3)
- ☐ Recent or no recovery (1)

Check all disturbances observed

- ☐ mowing
- ☐ grazing
- ☐ clearcutting
- ☐ selective cutting
- ☐ woody debris removal
- ☐ toxic pollutants
- ☐ shrub/sapling removal
- ☐ herbaceous/aquatic bed removal
- ☐ sedimentation
- ☐ dredging
- ☐ farming
- ☐ nutrient enrichment

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last revised 1 February 2001 jjm

ORAM v. 5.0 Field Form Quantitative Rating

Site:	Rater(s):	Date:

subtotal this page

Metric 5. Special Wetlands.

max 10 pts. subtotal

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Praires (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

Metric 6. Plant communities, interspersion, microtopography.

max 20 pts. subtotal

6a. Wetland Vegetation Communities.
Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [ ] Emergent
- [ ] Shrub
- [ ] Forest
- [ ] Mudflats
- [ ] Open water
- [ ] Other_____

6b. horizontal (plan view) Interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high(4)
- [ ] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [ ] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography.
Score all present using 0 to 3 scale.

- [ ] Vegetated hummucks/tussucks
- [ ] Coarse woody debris >15cm (6in)
- [ ] Standing dead >25cm (10in) dbh
- [ ] Amphibian breeding pools

Vegetation Community Cover Scale

0	Absent or comprises <0.1ha (0.2471 acres) contiguous area
1	Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2	Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality
3	Present and comprises significant part, or more, of wetland's vegetation and is of high quality

Narrative Description of Vegetation Quality

low	Low spp diversity and/or predominance of nonnative or disturbance tolerant native species
mod	Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generallyw/o presence of rare threatened or endangered spp
high	A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp

Mudflat and Open Water Class Quality

0	Absent <0.1ha (0.247 acres)
1	Low 0.1 to <1ha (0.247 to 2.47 acres)
2	Moderate 1 to <4ha (2.47 to 9.88 acres)
3	High 4ha (9.88 acres) or more

Microtopography Cover Scale

0	Absent
1	Present very small amounts or if more common of marginal quality
2	Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3	Present in moderate or greater amounts and of highest quality

GRAND TOTAL(max 100 pts)

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

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Appendix 2: Proposed Restoration Equivalents Calculation Method

The following is a method being proposed by the NC Division of Water Quality for calculating mitigation credit based on potential functional uplift as reflected by NC Wetland Assessment Methodology (NC WAM) assessments.

Functional Uplift through Enhancement

Summary of Calculations

Project Assessment:

Once a potential mitigation site is brought to the attention of the NC Division of Water Quality (DWQ) as a potential restoration, enhancement, and/or preservation site, it must be determined if the site is a viable mitigation project…

1) Wetland delineations should be conducted on the proposed site.
2) Staff from the regulatory agencies should meet on site to decide whether the site fits the existing definition of enhancement (e.g. as opposed to preservation).
3) NCWAM should be completed and calculated for the existing site conditions at several locations (depending on size) in the proposed enhancement site prior to any alterations being made on site.
4) Based on best professional judgement of DWQ staff, NCWAM should be completed and calculated for the projected outcome at the same locations in the enhancement site prior to any alterations being made on site. The answers and calculations should be based on the site conditions that are predicted to exist once the enhancement is complete.

Prior to approval of the mitigation project, the agencies must agree on the results of the NC WAM analysis for the existing site conditions and the projected site conditions prior to any alterations being made on site.

Functional Uplift Credit Determination: The results for the existing conditions (pre-construction) and the projected conditions (post-construction) of the assessment sites were used with the NC WAM functional lift equation:

$$Functional\,uplift = \frac{EnhAcres\,(MitQual_{post} - EnhQual_{pre})}{EnhTypeRatio}$$

to calculate the amount of functional uplift that should occur on site based on the projected site conditions. The values to be used for the "Mitigation Qual" are listed in the table below. The numerical value corresponding to the resultant NCWAM Rating or Score is what is used in the above equation.

NC WAM Score	Impact Site Quality	Mitigation Site Quality
High	X 2	X 2
Medium	X 1	X 1
Low	X 0.5	X 0.5

This functional uplift may be used as restoration equivalents and will be available and able to be used to fulfill the 1:1 restoration requirement once the intended wetland communities have developed.

The amount of mitigation required for a project can be calculated using the equation:

ImpAcres x ImpRatio x ImpQual

The impact ratio is typically the 2:1 ratio to accommodate for spatial and temporal losses. The Impact Qual will use the corresponding numerical value for the NCWAM rating/score calculated for the impact site.

The same mitigation ratios will continue to apply for restoration, enhancement, creation, and preservation (see table below).

Mitigation type	**Corps/EPA**	**DWQ**	**DCM**
Threshold	0.1 acre	1 acre	1000 sq. ft. of CAMA Coastal Wetlands
Restoration	1:1	1:1	1:1
Enhancement	2:1	3:1	NA
Creation	3:1	2:1	1:1
Preservation	5:1	5:1	NA

Appendix 3: Summary of NC WAM assessments, current conditions

The follow table is a summary of all jurisdictional wetlands (JWLs) ≥0.2acres that were assessed during this survey, including NC WAM functional ratings and ORAM scores.

Site code	Wetland code	Area (acres)	Wetland type [1]	Hydrology Condition Overall	WQ Condition Overall	WQ Cond/ Opportunity Overall [2]	WQ Opportunity Present Overall [2]	Habitat Condition Overall	Overall Functional Rating	ORAM Score	Comment
2	002	0.04	NTFM	LOW	LOW	LOW	NO	LOW	LOW	28	See footnote [3]
6	006a	0.5	BLH	*MEDIUM*	*MEDIUM*	HIGH	YES	LOW	*MEDIUM*	30	Ratings in italics adjusted from high to medium based on BPJ
6	006b	0.2	BLH	LOW	LOW	MEDIUM	YES	LOW	LOW	30	
11	011	0.4	RSF	LOW	LOW	LOW	YES	MEDIUM	LOW	70	
15	015	1.1	RSF	LOW	HIGH	HIGH	YES	LOW	LOW	58	
17	017	0.2	BLH	HIGH	HIGH	HIGH	YES	HIGH	HIGH	66	
19	019	0.4	FP	HIGH	HIGH	HIGH	YES	HIGH	HIGH	37	
49	049	0.2	Seep	HIGH	HIGH	X	X	HIGH	HIGH	56.5	
50	050	0.5	Seep	HIGH	HIGH	X	X	MEDIUM	HIGH	60.5	
51	051	1.0	NTFM	MEDIUM	LOW	LOW	YES	LOW	LOW	38	Recently logged
56	056	0.5	BLH	LOW	LOW	LOW	YES	HIGH	LOW	76	
58	058a	0.2	RSF	HIGH	HIGH	HIGH	YES	MEDIUM	HIGH	29	
58	058b	0.3	NTFM	MEDIUM	HIGH	HIGH	NO	HIGH	HIGH	41	Rated the same whether NTFM or RSF
63	063	1.5	BLH	MEDIUM	*LOW*	*LOW*	YES	LOW	*LOW*	40	Ratings in italics adjusted down based on BPJ
84	084	1.3	BLH	HIGH	HIGH	HIGH	YES	HIGH	HIGH	73	
100	100	3.2	RSF	HIGH	MEDIUM	HIGH	YES	HIGH	HIGH	58	
102	102	1.3	BLH	HIGH	HIGH	HIGH	YES	HIGH	HIGH	72	
106	106	0.2	HWF	HIGH	HIGH	HIGH	YES	HIGH	HIGH	24	
108	108	13.9	NTFM	HIGH	HIGH	HIGH	NO	HIGH	HIGH	76	
109	109	6.7	BLH	HIGH	HIGH	HIGH	YES	HIGH	HIGH	60	
118	118	1.0	RSF	HIGH	HIGH	HIGH	YES	HIGH	HIGH	76	
119	119	0.2	BLH	LOW	LOW	LOW	YES	HIGH	LOW	61	
120	120	0.6	Seep	HIGH	HIGH	X	X	HIGH	HIGH	68	

Site code	Wetland code	Area (acres)	Wetland type [1]	Hydrology Condition Overall	WQ Condition Overall	WQ Cond/ Opportunity Overall [2]	WQ Opportunity Present Overall [2]	Habitat Condition Overall	Overall Functional Rating	ORAM Score	Comment
124	124a	0.5	BLH	LOW	LOW	LOW	YES	HIGH	LOW	43	
124	124b	0.4	RSF	LOW	LOW	LOW	YES	HIGH	LOW	65	
124	124c1	0.2	RSF	*MEDIUM*	*MEDIUM*	*MEDIUM*	YES	HIGH	*MEDIUM*	57	Ratings in italics adjusted up based on BPJ
124	124c2	2.4	RSF	*MEDIUM*	*MEDIUM*	*MEDIUM*	YES	HIGH	*MEDIUM*	46	Ratings in italics adjusted up based on BPJ
125	125a	1.2	BLH	HIGH	HIGH	HIGH	YES	HIGH	HIGH	47	Recently logged
125	125b1	0.7	RSF	HIGH	HIGH	HIGH	YES	HIGH	HIGH	72	Ungrazed section
125	125b2	2.0	RSF	HIGH	HIGH	HIGH	YES	HIGH	HIGH	63	Grazed section
128	128	0.04	Seep	LOW	LOW	X	X	HIGH	LOW	53	See footnote [3]
none	Birthday 1	0.20	NTFM	HIGH	HIGH	HIGH	NO	MEDIUM	HIGH	63	See footnote [3]
none	Birthday 2	0.20	RSF	HIGH	HIGH	HIGH	YES	HIGH	HIGH	67	See footnote [3]

[1] Wetland type refers to those described in the Dichotomous Key to NC Wetland Types (NC WFAT, 2008). Abbreviations as follows:

BLH: Bottomland hardwood forest
HWF: Headwater forest
RSF: Riverine swamp forest
NTFM: Non-tidal freshwater marsh
Seep: Seep
FP: Floodplain Pool

[2] "X" indicates that the function is not applicable to that wetland type.

[3] These wetlands were not included in the summaries of the report due to either their small size (002 and 128) or because they were not part of the random site selection (Birthday1 and Birthday2). Descriptions are included in the Addendum of Site Descriptions.