

What is the National Wetland Condition Assessment (NWCA)?

The NWCA is a statistical survey of the quality of our Nation's wetlands designed to:

- Determine the ecological integrity of wetlands at regional and national scales
- Build state and tribal capacity for monitoring and analyses.
- Promote collaboration across jurisdictional boundaries
- Achieve a robust, statistically valid set of wetland data
- Develop baseline information to evaluation progress

NWCA Timeline

2007-2009	2010	2011	2012	2013
RESEARCH	DESIGN	FIELD	LAB / DATA	REPORT
Scientific issues	Target population	Training	Lab analysis	Data analysis
Policy issues	Indicators	Site reconnaissance	Lab quality assurance	Presentations
Supplemental data analysis	Field / lab practices	Sample collection	Data entry	Peer review
Methods refinement	Quality assurance plan	Field quality assurance	Data quality assurance	Final report

No really, what is it?



Applied Two Wetland Assessment Methods

- Level 2: USA RAM (rapid assessment method)
 - Twelve metrics
- Level 3: NWCA (intensive assessment method)



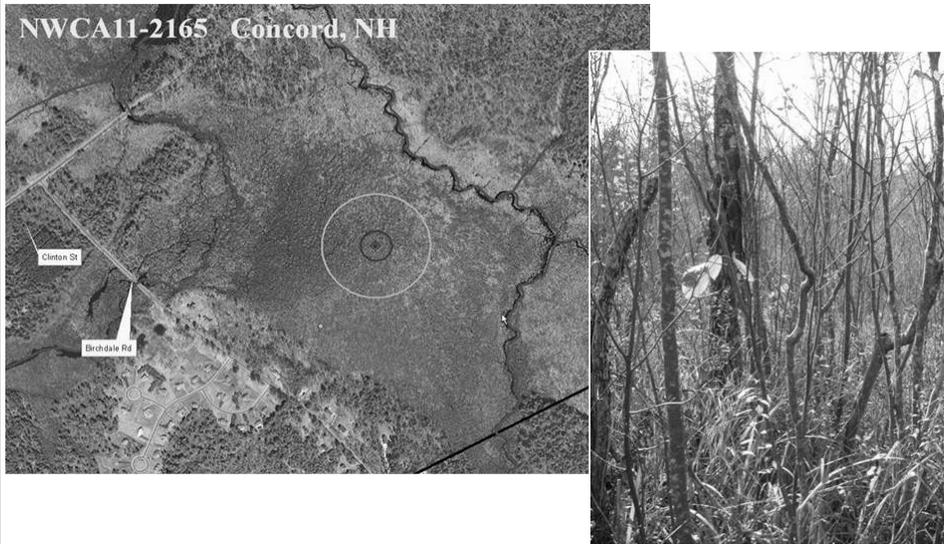
What did we sample?

- Vegetation
 - Presence and abundance of plants (ground cover through tree canopy)
 - Community complexity
- Algae collected from sediments and the surface of plant stems and leaves
- Soil properties (and chemistry)
- Surface water (chemistry)
- Characterized assessment area and buffer
 - Identified stressors

Pre-Sampling

- Site visits for verification of wetland presence, Cowardin class in target sampling population, and access
- Coordination with NHDES Watershed and Subsurface Bureau staff, NRCS staff and EPA
- Three-day EPA regional training in May
- Tentative schedule and logistics
- Practice day
- Equipment inventory and purchases
- Final site selection – 11 sites with two of them revisit sites = 13 field surveys

Site Challenges: Access!

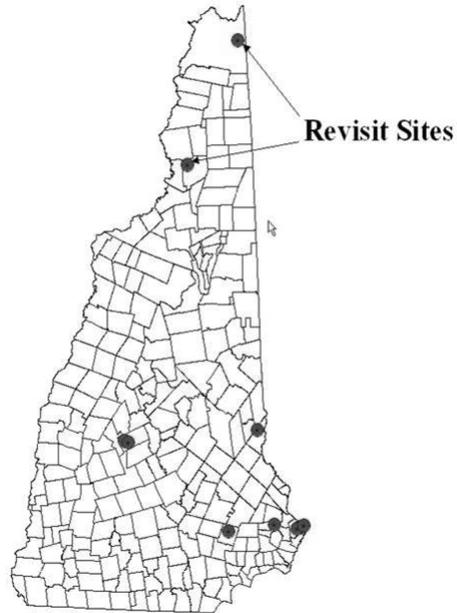


Dropped Sites

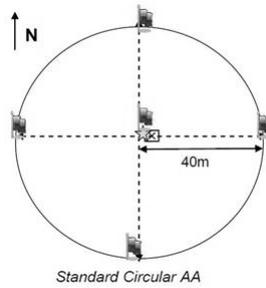
- Access denied by landowner
- Water depth is >1m
- Assessment area is too small (<0.1 ha)
- Not a wetland (“Cowardin” definition)
- Treacherous blowdowns, insane number of hornets nests, and walls of poison ivy all at one site



2011 NWCA Final Sites



Establishment of Assessment Area

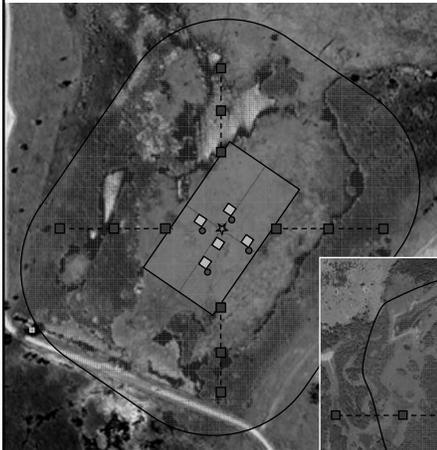


Standard Circular AA

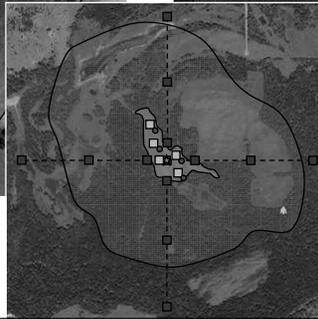
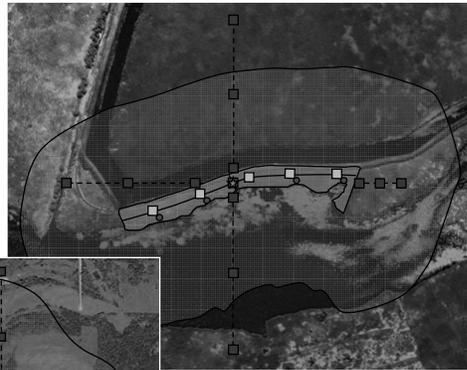


Assessment Area Layouts

Wide Polygon



Narrow Polygon



**Wetland
Boundary**

Establish Vegetation Plots and Soil Pits

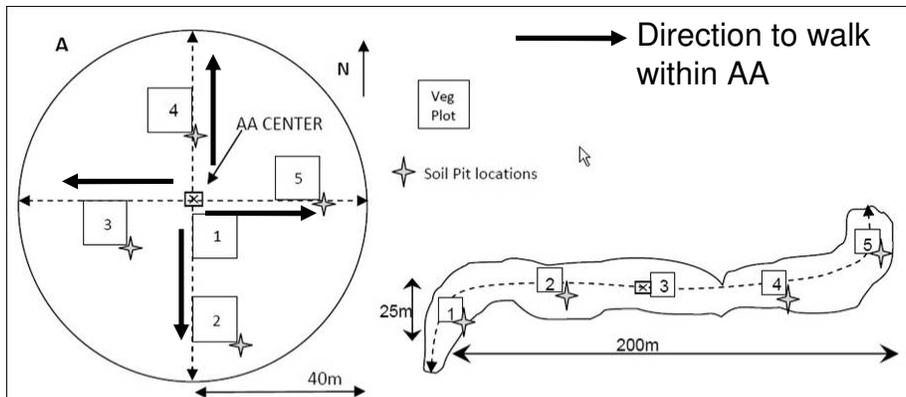
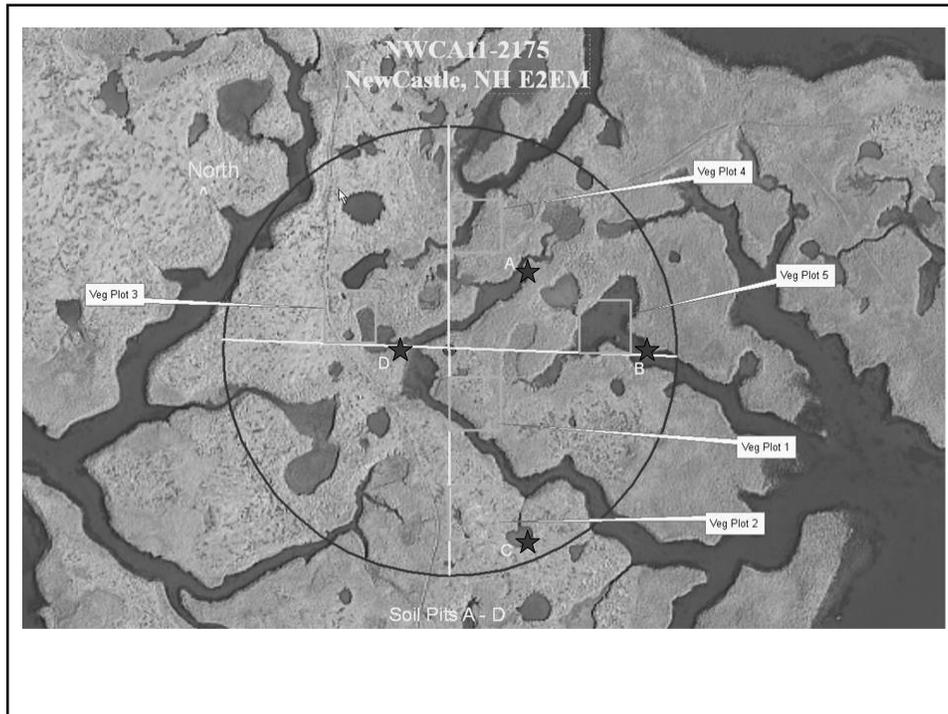


Figure 6-1. Standard Soil Pit Locations. **A.** Standard Circular AA Layout with five Veg Plots and four Soil Pits. **B.** Narrow Polygon AA Veg Plot Layout with Soil Pits.



Soils

- Soil profile and physical characteristics
- Hydric soil field indicators
- Soil chemistry and bulk density
- Soil isotopes and enzymes





Soil Data Sheets

FORM S-1 : NWCA SOIL PROFILE DATA (Back)
Soil Pit: OA OB OC OD

Reviewed by (initial): _____

FORM S-1 : NWCA SOIL PROFILE DATA (Front)
Soil Pit: OA OB OC OD

Reviewed by (initial): _____

Site ID: **NWCA11** Soil Map Unit Symbol from Site Packet: _____ Date: **2 0 1 1**

Fill in if this Soil Pit is the Representative Pit (top 125cm deep) and indicate in the Samples Collected column the bulk density (B) and Chemistry (C) samples collected.

Sample ID, if Representative Pit: _____ Final Pit Depth: _____ cm

N W C A 1 1

SOIL PIT LOCATION
Near Veg Plot #: _____
Standard location near SE corner of Veg Plot
Alternate Location _____

SOIL PIT ATTRIBUTES
Total Pit Depth: _____ cm
Time of Pit Excavation _____ (hh:mm)
Lighting Conditions: _____ 24 hr clock
 Bright Dappled Overcast Shaded

CATEGORICAL DATA CELLS:
 Fill in this bubble to confirm that a filled bubble indicates presence (except for Absent in the Redox, Organic, or Mottle Features Section) and an empty bubble indicates absence.

COVER DATA CELLS:
 Fill in this bubble to confirm that empty Data Units for % Surface Area Rock or Roots and % Horizon with Distinct or Prominent Features equal zero.

IMPENETRABLE LAYER PRESENT
If present, indicate Type:
 Clay Pan
 Cemented layer
 Bedrock
 Large boulder
 Other _____

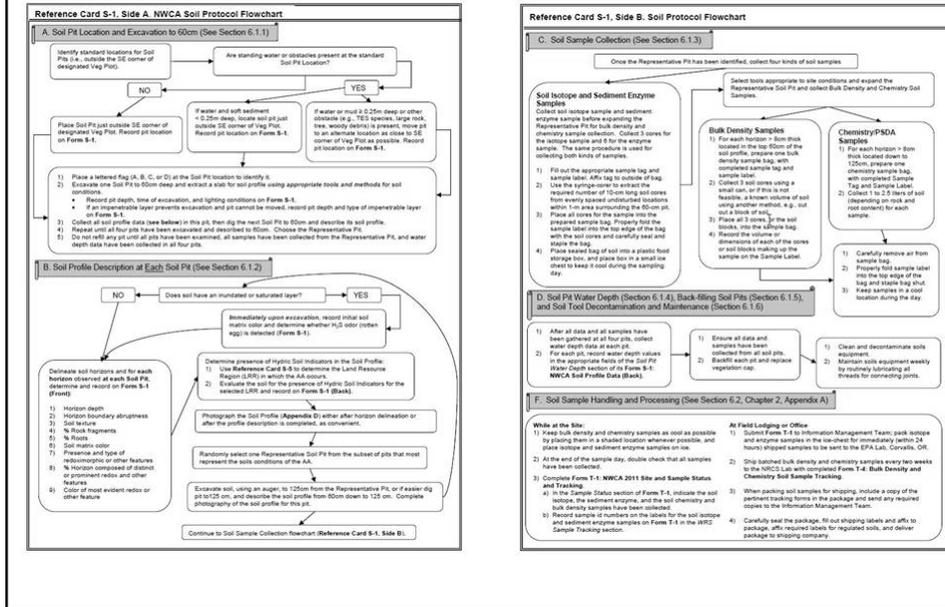
INITIAL READINGS
 Hydrogen Sulfide odor (rotten eggs)
 Insaturated/saturated soil in pit; if Present: _____
Initial Color: _____
Color reading depth from surface: _____ cm
Color change after exposure to air _____

Horizons	Soil Texture (fill one per horizon)				Soil Matrix Color			Redoximorphic, Organic, or Mottle Features				Color of Most Evident Feature								
	Horizon Name (soil scientist boundary)	Depth (cm) to lower boundary	Fill in if lower boundary is abrupt (≤ 2 cm)	Stability	Lower/Clayey	Mucky/Mineral	Organic P = Peat, M = Muck, MP = Mucky Peat U = Unspecified	Hue	Value	Chroma	Compositional = soil Fe = iron Mn = Manganese C = Carbon U = Unstable In toxicity	Redox Features F = iron Fe = iron Mn = Manganese C = Carbon U = Unstable In toxicity	Matrix A Org. Features M = mottle MS = masked sand grains, CB = organic soils, OF = other organic features	% Masked Sand Grains	% of Horizon with Distinct or Prominent Features	Hue	Value	Chroma	Flag	
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				

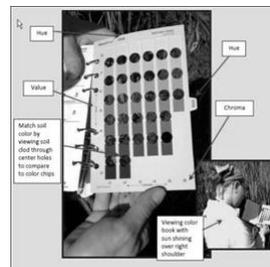
Flag codes: K = No measurement made, U = Suspect measurement, F1, F2, etc = misc. flags assigned by each field crew. Explain all flags in comment section on the back of this form.

1968209140

Flowcharts to Follow...



Soil Profile Description



From the representative soil pit, the samples came forth...

bulk density samples



The really fun part... Carrying out the soil samples on a 90°day!

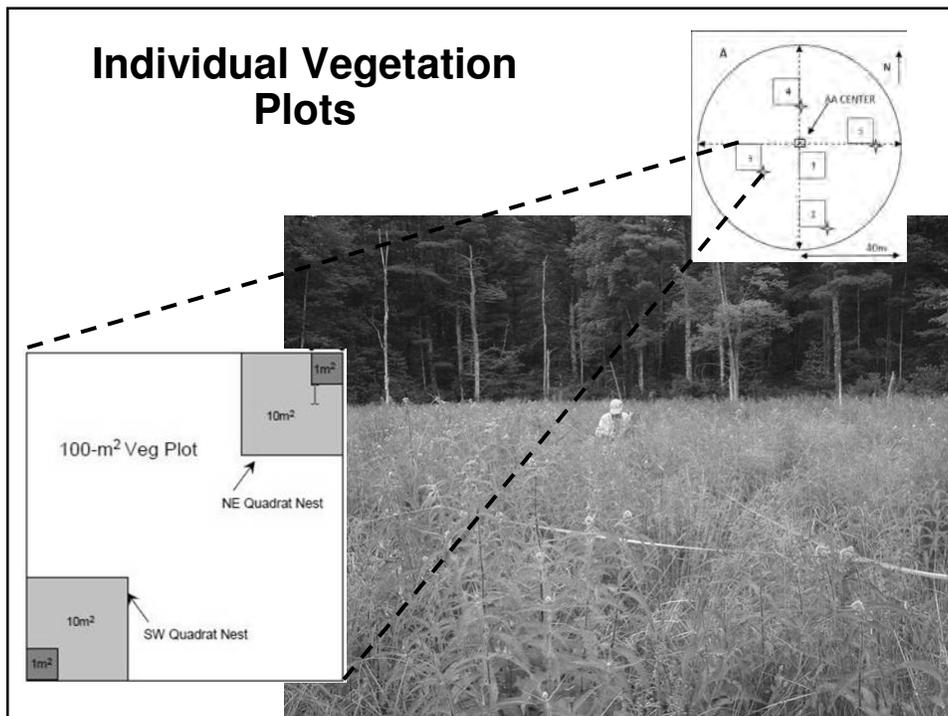


Vegetation

- Vascular plant species presence
- General cover estimates
- Vascular plant species height and cover
- Vertical strata data for vascular species
- Bryophyte, lichen, epiphytes, and algae data
- Ground surface attribute data
- Snag count and tree species presence, count and cover



Individual Vegetation Plots





Pretty Easy Assessment Area

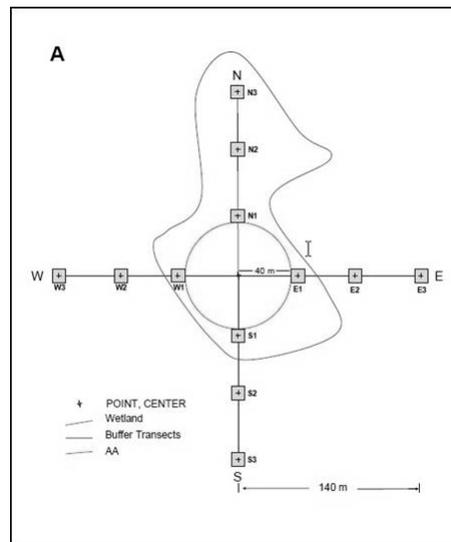


Medium Not-So-Bad Assessment Area



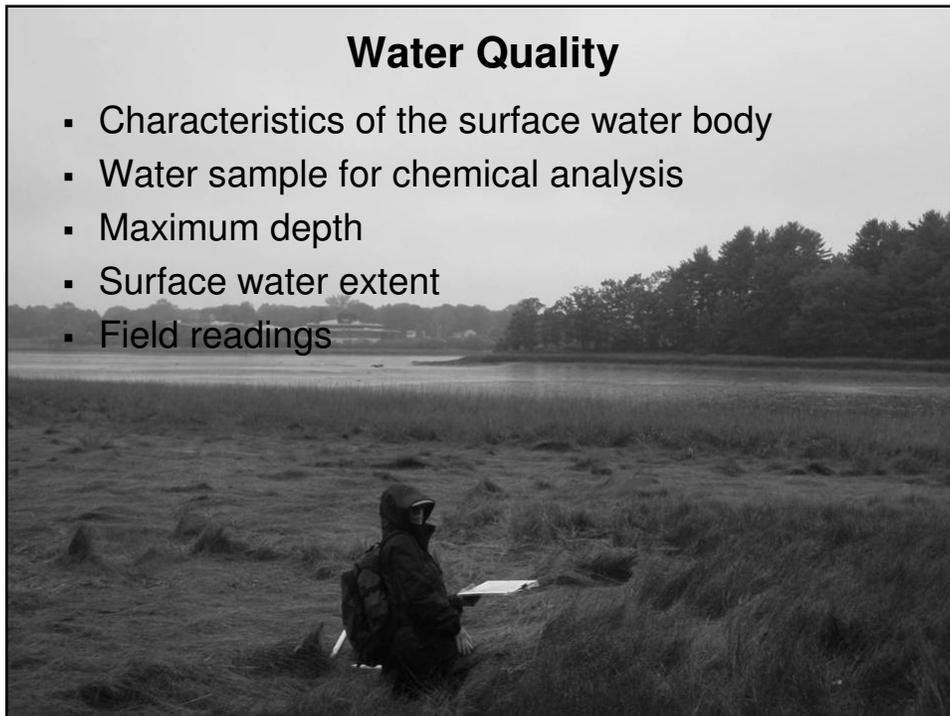
Establish Buffer Plots for Characterization

- Description of natural cover strata
- Stressor Presence/Absence
 - Residential/Urban
 - Hydrology
 - Agricultural/Rural
 - Industrial
 - Habitat Vegetation
- Invasive Species



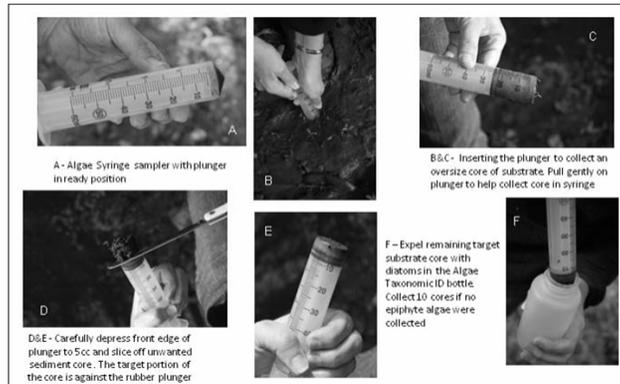
Water Quality

- Characteristics of the surface water body
- Water sample for chemical analysis
- Maximum depth
- Surface water extent
- Field readings



Algae

- Taxonomic ID sample
- Algal toxins sample
- Chlorophyll-a biomass sample



USA Rapid Assessment Method (USA-RAM)

- The primary purpose ... to assess wetland condition in a shorter timeframe than required for more detailed sampling.
- Secondary purposes include:
 - Exploring relationships between ecology, stress, and buffers to demonstrate effects on condition.
 - Providing a RAM to US States and Tribes that they can further develop for their own purposes.

USA RAM

Table 1: USA RAM Attributes and Metrics of wetland condition and stress.

Attributes	Condition Metrics	Stress Metrics
Buffer	Percent of AA Having Buffer	Stress to the Buffer Zone
	Buffer Width	
Hydrology	None	Alterations to Hydroperiod
		Stress to Water Quality
Physical Structure	Topographic Complexity	Habitat/Substrate Alterations
	Patch Mosaic Complexity	
Biological Structure	Vertical Complexity	Percent Cover of Invasive Plants
	Plant Community Complexity	Vegetation Disturbance

USA-RAM Overview



USA-RAM Metrics 1–3 (Buffer Metrics)

- Metrics 1 and 2 completed in the office and then verified in the field.
- Metric 3 completed in the field

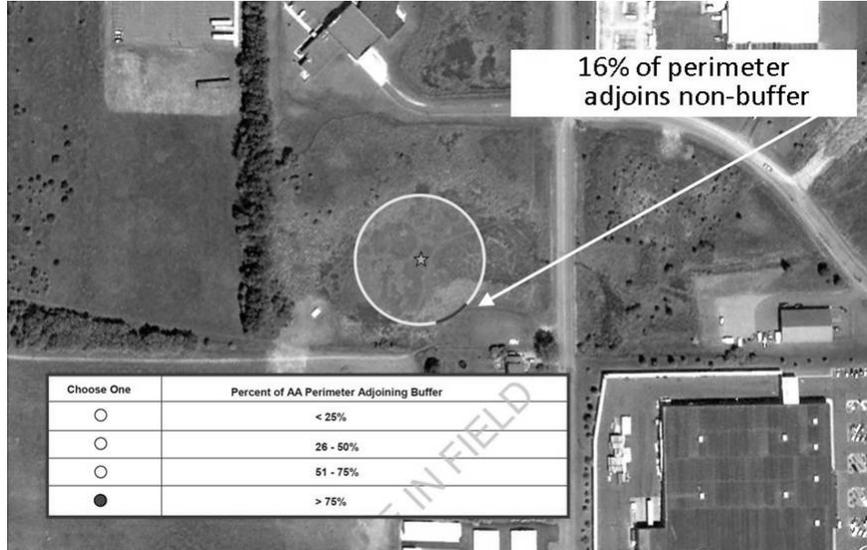
USA-RAM Metrics 4-7 (Condition Metrics)

- Completed in the field

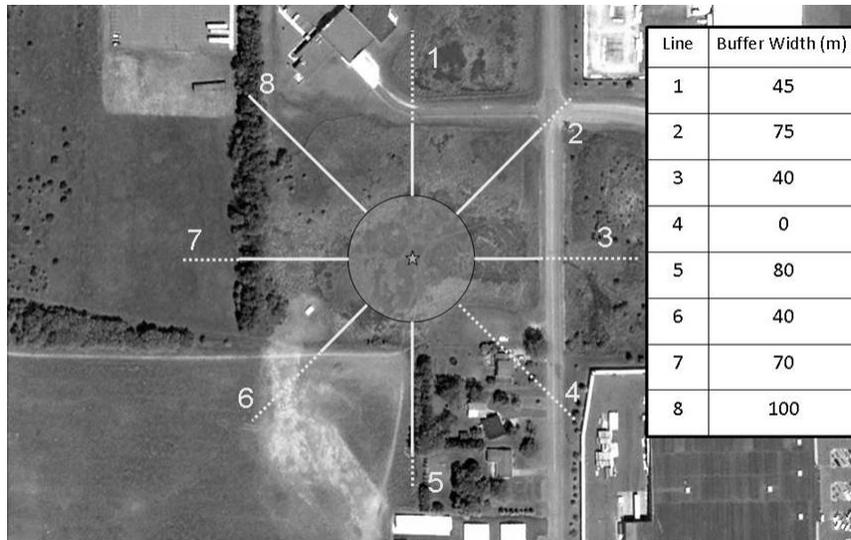
USA-RAM Metrics 8-12 (Stressor Metrics)

- Completed in the field

RAM Metric 1: Percent of AA having buffer *Completed in office*



RAM Metric 2: Buffer Width *Completed in office*



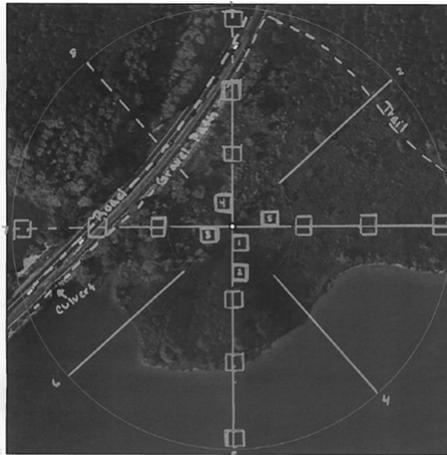
RAM Metric 3: Stressors in the Buffer Zone (contd)

- Stressors listed on RAM Metric 3 (Form 2) are ranked on a scale of 1, 2, or 3.

Portion of Buffer Zone Influenced by Stressor	Severity Code
less than one-third	1
between one-third and two-thirds	2
at least two-thirds	3

- For the sake of this Metric, the buffer zone is considered to be the entire 100m area around the AA, regardless of land use.

Buffer Area assessed by RAM Metric 3: Stressors in the Buffer Zone



**National Wetland Condition Assessment
Site NWCA11 - RD-A**

County, State: Wake, NC
 Latitude: 35.843092
 Longitude: -78.802490

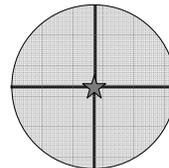
Map Scale: 1:1,000
 0 20 40 80 Meters

Wetland Class: PSS
 Panel: Demonstration
 Ownership: State
 Name: Lake Crabtree Park

Legend
 ○ NWCA Demonstration Site
 □ 40 meter assessment area (AA)
 □ 140 meter buffer

Prepared by the U.S. Environmental Protection Agency

RAM Metrics 4-12

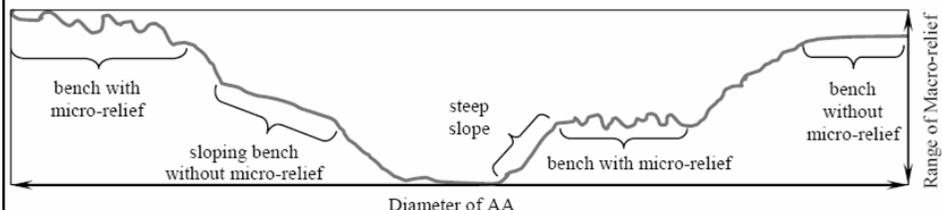


- Focus on stressors within the AA
 - Metric 4: Topographic Complexity
 - Metric 5: Patch Mosaic Complexity
 - Metric 6: Vertical Complexity
 - Metric 7: Plant Community Complexity
 - Metric 8: Stressors to Water Quality
 - Metric 9: Alterations to Hydroperiod
 - Metric 10: Habitat /Substrate Alterations
 - Metric 11: Percent Cover of Invasive Plant Species
 - Metric 12: Vegetation Disturbance

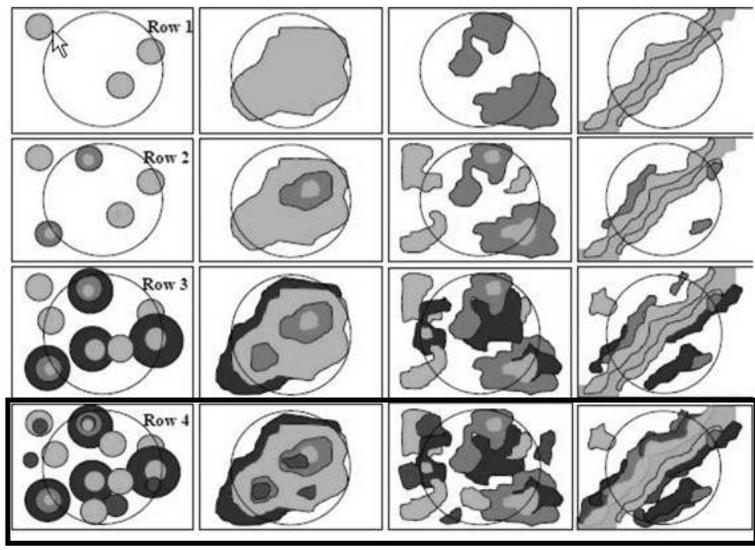
USA RAM: Metric 4 Topographic Complexity

Indicators	Check if observed
Multiple horizontal plains, benches, terraces, or flats at different elevations	
Multiple slopes of varying steepness	
Natural or artificial levee or berm	
Bank slumps or undercut banks	
Undercut banks	
Multiple high water marks etched in substrate	
Potholes, sink holes or similar depressions not caused by animals	
Natural or artificial channels	
Natural or artificial swales	
Animal burrows or spoil piles from burrows (including ant or termite mounds)	
Animal tracks deep enough to hold water (e.g., cattle or elk tracks)	
Wallows, pig damage, or similar scale excavations by animals	
Inorganic sediment mounds not made by animals	
Natural or artificial debris or wrack along high water lines	
Natural or artificial debris in topographic low areas	
Natural or artificial debris dispersed across AA (tree limbs, lumber, etc)	
Plant hummocks or tussocks	
Soil cracks or fissures	
Cobbles or boulders	
Bare ground	
Total Number of Indicators Observed	

USA RAM: Metric 4 Topographic Complexity



USA RAM: Metric 5 Patch Mosaic Complexity



USA RAM: Metric 6 Vertical Complexity

- Estimate the percent cover of each plant stratum in the AA (5 ranges between <10% - > 50%).
 - Submerged (any depth)
 - Floating or Floating-leaved
 - Short Emergent (< 0.5 m)
 - Tall Emergent (≥ 0.5 m)
 - Short Woody Plants (<5.0 m)
 - Vines (any present)
 - Tall Woody Plants (≥ 5.0 m)

USA RAM: Metric 7 Plant Community Complexity

- Identify all plant species that comprise at least 10% relative cover of each plant stratum in Metric 6.

Plant Strata disregard strata with less than 10%cover (see Metric 6)	For each Plant Stratum List All Plant Species Comprising at least 10% Relative Cover					
	Species Name	mark if Invasive	% Cover	Species Name	mark if Invasive	% Cover
Submerged (any depth)						
	<i>Total Percent Coverage for All Invasive Species in Stratum</i>					
Floating or Floating- leaved						
	<i>Total Percent Coverage for All Invasive Species in Stratum</i>					
Short						

Note: USEPA uses USDA PLANTS nomenclature

USA RAM: Metric 8 Stressors to Water Quality

- Indicators of water quality stress observed in AA. Each observed indicator is ranked as (1) not severe; (2) moderately severe; or (3) severe.

If stressor is present, mark its severity			Field Indicators by Stressor Category
<i>1</i>	<i>2</i>	<i>3</i>	Point Sources
1	2	3	Point source inputs (discharge from wastewater plants, factories, etc)
1	2	3	Stormwater inputs (discharge pipes, culverts, sewer outfalls)
<i>1</i>	<i>2</i>	<i>3</i>	Sedimentation/Pollutants
1	2	3	Debris lines on plants, trees or silt-laden vegetation
1	2	3	Sedimentation (e.g., the presence of sediment fans, deposits or plumes)
1	2	3	Industrial or domestic spills or discharges (odors; foam, oil sheen*)
1	2	3	Turbidity in the water column



USA RAM: Metric 9 Alterations to Hydroperiod

- Indicators of altered hydroperiod observed in AA.
- Each observed indicator is ranked as (1) not severe; (2) moderately severe; or (3) severe.

If stressor is present, mark its severity			Field Indicators
1	2	3	Ditches /channelization within AA
1	2	3	Dikes/dams/levees/berms at AA margin or within AA or roadbed or railroad (acting as block to water flows into or through AA)
1	2	3	Channels have deeply undercut banks and/or bank slumps or slides
1	2	3	Culverts, pipes (point sources) into AA (<i>change in water quantity</i>)
1	2	3	Water level control structure that impound water in all or part of the AA
1	2	3	Upland plant species encroaching into AA (due to drying of wetland)
1	2	3	Die-off of trees within AA due to increased ponding (exempting beaver impounded sites)
1	2	3	Tidal restriction in tidal wetlands (restricts flows to and from AA)

USA RAM: Metric 10 Habitat /Substrate Alterations

- Indicators of altered substrate observed in AA. Each observed indicator is ranked as (1) not severe; (2) moderately severe; or (3) severe.

If stressor is present, mark its severity			Field Indicators
1	2	3	Soil subsidence , scour or surface erosion (root exposure, etc)
1	2	3	Off-road vehicles, mountain biking, trails cut, etc.
1	2	3	Inorganic sedimentation inflow (sediment accumulation around vegetation, deep sediment splays , recent vegetation burial, etc)
1	2	3	Dredging or other prominent excavation at AA margin or in AA
1	2	3	Grazing by domesticated or feral animals in AA (includes trampling, digging , wallowing, etc)
1	2	3	Grazing by native ungulates.
1	2	3	Recent farming activity (plowing, disking , etc.)
1	2	3	Soil compaction by human activity (parking by cars, heavy machinery, etc)
1	2	3	Filling, grading, or other prominent deposition of sediment

USA RAM: Metric 11 Percent Cover of Invasive Plant Species

- Indicate percent cover of invasive plant species using data collected in Metric 7 (Plant Community Complexity).

Invasive Plant Species That Commonly Invade Wetlands	
European milfoil (<i>Myriophyllum spicatum</i>)	Purple loosestrife (<i>Lythrum salicaria</i>)
Garlic mustard (<i>Alliaria petiolata</i>)	Reed canarygrass (<i>Phalaris arundinacea</i>)
Giant reed (<i>Phragmites australis</i>)	Russian olive (<i>Elaeagnus angustifolia</i>)
Giant salvinia (<i>Salvinia molesta</i>)	Salt cedar (<i>Tamarix spp</i>)
Poison hemlock (<i>Conium maculatum</i>)	Water hyacinth (<i>Eichhornia crassipes</i>).

- Add any invasive species listed in NH rules (aquatic or terrestrial)

USA RAM: Metric 12 Vegetation Disturbance

- Indicators of vegetation disturbance observed in AA.
- Each observed indicator is ranked as (1) not severe; (2) moderately severe; or (3) severe.

If stressor is present, rank its severity			Field Indicators by Stressor Category
1	2	3	
			Human Use and/or Management
1	2	3	Mowing within AA (or at AA margin)
1	2	3	Forest - selective cut
1	2	3	Forest - clear cut
1	2	3	Prominent removal of large woody debris
1	2	3	Mechanical plant removal besides tree cutting or woody debris removal
1	2	3	Evidence of planting of non-native vegetation
1	2	3	Chemical vegetation control (herbicide application, defoliant use)
1	2	3	Farming (recent plowing, disking , etc)
			Excessive Grazing or Herbivory
1	2	3	Grazing by domestic or feral animals (cows, sheep, pigs, etc)

Vegetation – Post Sampling

- Plants pressed same day until dried.
- Plants frozen to kill “hitchhikers,” labeled, and stored in herbarium cabinet.
- Identification of unknowns
- Exchange with VT for QA/QC checks
- 2nd DES botanist for spot check



Soils Post-Sampling

...SOP's for how to bag and staple soil samples for shipping!

1) Take the top 5cm (2 inches) of the sample bag and make the first fold away from side of bag on which the sample tag is affixed. Note, the sample tag displays key tracking information and must always be affixed to the front of the bag.

2) Make a second fold taking the top 2.5cm (1 inch) of the first fold and folding backwards towards the sample tag on the front of the bag.

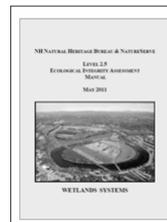
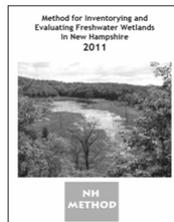
Note: sample label inserted between first and second folds before stapling.

3) Insert the sample label tab into the second fold with the label information facing outward. Use a heavy duty stapler and staple through the fold and label. Next staple the left and right sides of the double fold. Note the bag in this illustration is thinner and somewhat smaller than the actual sample bag will be.

Heavy Duty Stapler

Now what?

- EPA's national report due in late 2013.
 - Anticipate that it will be of very limited value on a state level (Good, Fair, Poor)
- NHDES Watershed and Wetlands Bureau collaborating with NH Heritage Bureau and UNH to begin developing state level monitoring and assessment tools.
- Long slow process – starting with a lack of staff and resources for traditional monitoring.



Overall value of NWCA – very high!

- First experience with intensive wetland sampling
- Partnership and collaboration with NRCS
- Collaboration among bureaus at NHDES
- Identified possible parameters to consider for developing monitoring and assessment tools
- Additional experience with EPA National Aquatic Resource Surveys
- It was a logistical challenge and hard field work, but it was fun too!

NHDES:

Ted Walsh, Team Coordinator and Botany Assistant
Sandy Crystall, Ecologist/Botanist
Dave Neils
Peg Foss
Amy Smagula, QC of initial unknown plant species
Doug Smith, Soils
Dawn Buker, Soils
Bill Meagher, Intern
Jessica Whitmore, Intern
Julie Swan, Intern

USDA-NRCS:

Joe Homer
Karen Dudley

VT-ANR:

Alan Quackenbush, Plant QA

