A three-tiered approach to wetland condition assessment

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Introduction

BACKGROUND

Wetland health reflect natural processes & human-mediated stressors. Ecosystem services in degraded wetlands are often compromised, including key functions related to water quality/security, stormwater/pollution/erosion control, and wildlife habitat. Effective wetland management in NYS requires an understanding of current wetland condition: from our urban cities to our pristine parks. Wetland survey data can inform systems-specific reference standards for use in management, restoration, and mitigation.

Level 1: Landscape Condition Assessment (LCA)

LCA model includes spatial data from 3 broad input classes
Transportation Managed land Development

COMMON METRICS & APPLICATIONS

Mean LCA score = average value of all pixels within a defined area. For example, a wetland community polygon or a 540-m radius circle around a point; we use the latter when assessing sample points.

LCA2 model (Fig. 2, right)
For comparison, average LCA scores were calculated for the Adirondack Park (undeveloped) & NYS urban area (per US census). Map legend color categories assigned using Jekes natural breaks and statistical analyses reported by Shappell et al. (2016).

Full LCA methodology & data available at www.nynhp.org/shappell

Figure 3: Range of LCA scores among our current survey points (n = 136), most occur in undeveloped/urban areas. Brown whiskers indicate the 5th and 95th percentiles; dots = outliers; solid line = sample median.

Level 2: NY Rapid Assessment Method (NYRAM)

Onscreen assessment (Part A) includes the large Landscape Buffer, while the field survey (Part B) focuses on the smaller Survey Area + Field Buffer

Part A landscape categories

Fragmenting feature tally (Fig 4) Land use land cover (% LULC)

Part B stressor checklist

Pres/Abs categories: Vegetation, Hydrophysical & Topography, Sediment transport, Land use/land cover, Invasive plant richness/ dominance.

CURRENT NYRAM DATA DISTRIBUTION

Figure 4: Example of the 40 m-radius Survey Area (small blue circle) & the 540 m-Landscape Buffer (note fragmenting feature). NYRAM user manual/worksheets: www.nynhp.org/shappell

Level 3: Vegetation composition plot surveys

Sample point selection: Most data points were selected using a spatially balanced, stratified random sampling procedure.

NYNHP level 3 wetland plot survey methodology is modified after Post et al. (1998); current sample size following this method is 143. Data collected during National Wetland Condition Assessment (2011, 2016) using US EPA protocols is also included in the results (n = 26).

VEGETATION STRUCTURE

Plot-scale (Fig. 6) plant richness/cover. Sub-plot (i) species' cover (%), strata cover & height (m), tree diameter at breast height, litter depth (cm) and abiotic data.

Descriptive metrics: Plant species richness, % invasive cover, tree basal area (m²/ha), floristic quality per Coefficient of Conservatism (mean or weighted CCo). Figure & example 0.5 ha plot (left & sample site right) an emergent marsh in Chenango County, NY.

COEFFICIENT OF CONSERVATION “CC”

Scores range from zero to 10, and describe plant species' rangecoming NY assemblages and their ecological tolerances. For example, generalists such as arrowhead have wide ecological tolerances and are therefore given a lower score (Swink & Wilhelm 1994; Wilhem & Masters 1995). While weighted CoC scores by wetland community

Figure 7: Weighted mean CoC scores by wetland community (left to right): invaded marsh (n=7), emergent marsh (n=6); deciduous-hardwood swamp (n=5); Needle-leaved evergreen swamp (n=1); Dwarf-shrub bog (n=1). Contrast with n = >5 score not included in the graph.

Weighed CoC scores by wetland community

Figure 8: Weighted mean CoC scores by wetland community (left to right): invaded marsh (n=7), emergent marsh (n=6); deciduous-hardwood swamp (n=5); Needle-leaved evergreen swamp (n=1); Dwarf-shrub bog (n=1). Contrast with n = >5 score not included in the graph.

Results: Cross-level validation comparison

Floristic quality metrics from the NYNHP site surveys (Level 3) significantly correlate with the landscape model (Level 1) & NY rapid assessment method (Level 2).

Statistical analyses: Spearman's rank correlation analysis (rs). LCA graph scale uses a log scale because the data have a non-normal distribution. More analysis is reported in Shappell et al. (2016).

Literature cited & Acknowledgements

LITERATURE CITED

ACKNOWLEDGMENTS


Data sharing: This poster includes 14 data points collected by Steve Langdon et al. on part of the Adirondack Park Agency WPDG (EPA CD96295000-0). Partners & support: K. Drake & M. Junior (EPA ID), J. Jacobsen, K. Bliss, T. Post (NYS DEC), D. Leopold (SUNY-ESF), NYS DOT & UPSR. T. Olsen (EPA, spatial state); landowners who allowed us to sample on their property & NYNHP staff/field crews.

Figure, diagrams, & images created by L. Shappell, maps funded by USFWS grants: NY Wetlands Partnership Program (2017) & NYNHP Conference, April 2017.