WETLAND RAPID ASSESSMENT: TECHNICAL GUIDELINES FOR DEVELOPING, REVIEWING, AND REVISING ASSESSMENT METHODS

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U.S. ARMY

US Army Corps of Engineers®

ERDC

WETLAND DELINEATION SCIENCE

STREAM SCIENCES

MITIGATION SCIENCE

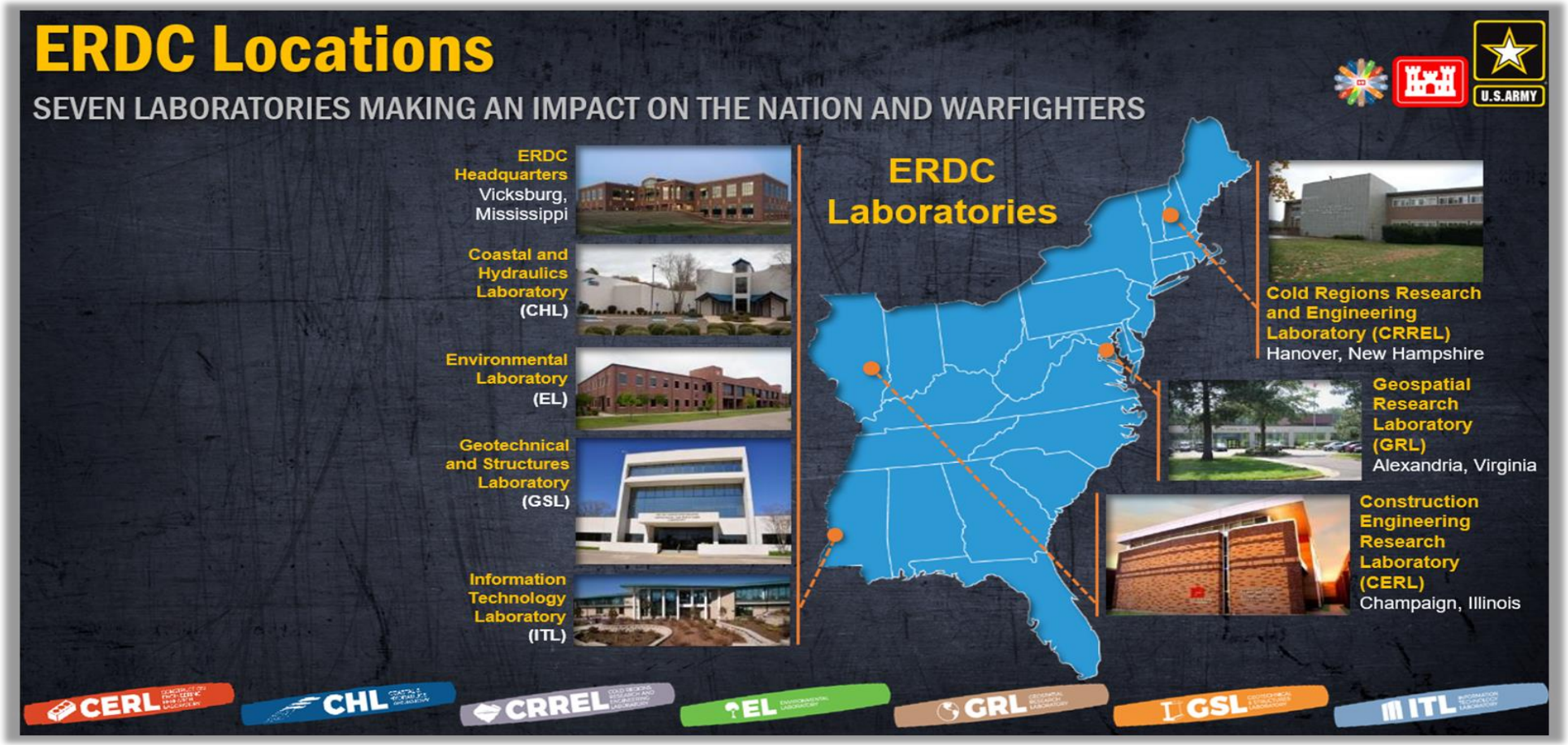
ASSESSMENT METHODOLOGIES

NATIONAL WETLAND PLANT LIST

TECHNOLOGY TRANSFER

TRAINING

ERDC



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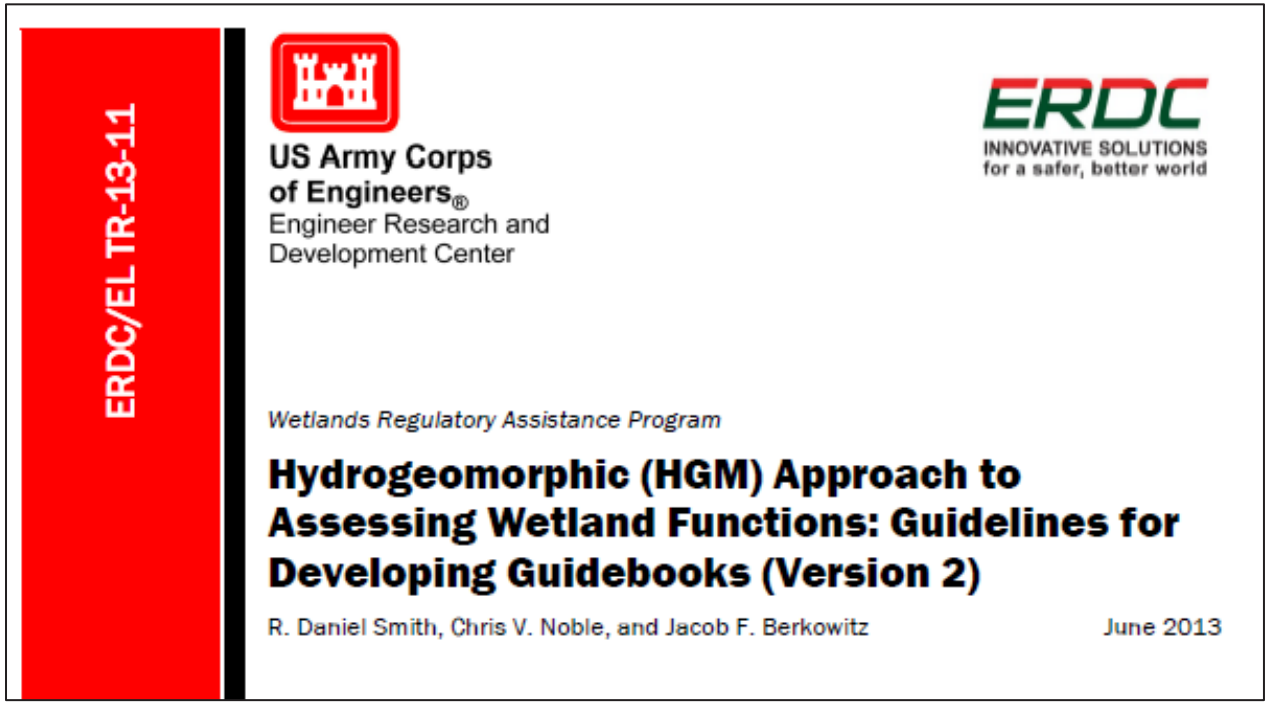
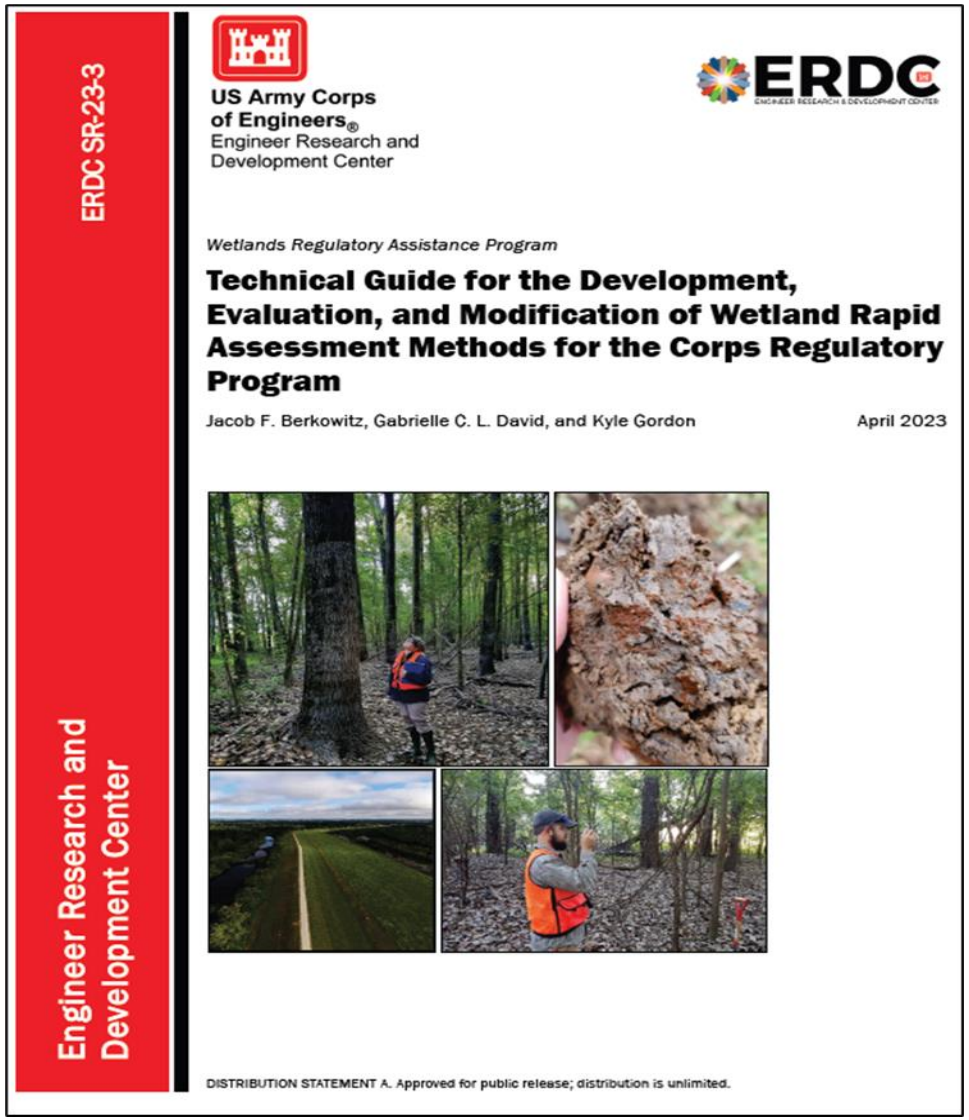
WETLAND ASSESSMENT METHODS | HISTORY



(Smith et al. 2013; David et al. 2021)

TECHNICAL GUIDE FOR THE DEVELOPMENT, EVALUATION, AND MODIFICATION OF WETLAND RAPID ASSESSMENT METHODS FOR THE CORPS REGULATORY PROGRAM



https://www.researchgate.net/publication/370655648_Technical_Guide_for_the_Development_Evaluation_and_Modification_of_Wetland_Rapid_Assessment_Methods_for_the_Corps_Regulatory_Program

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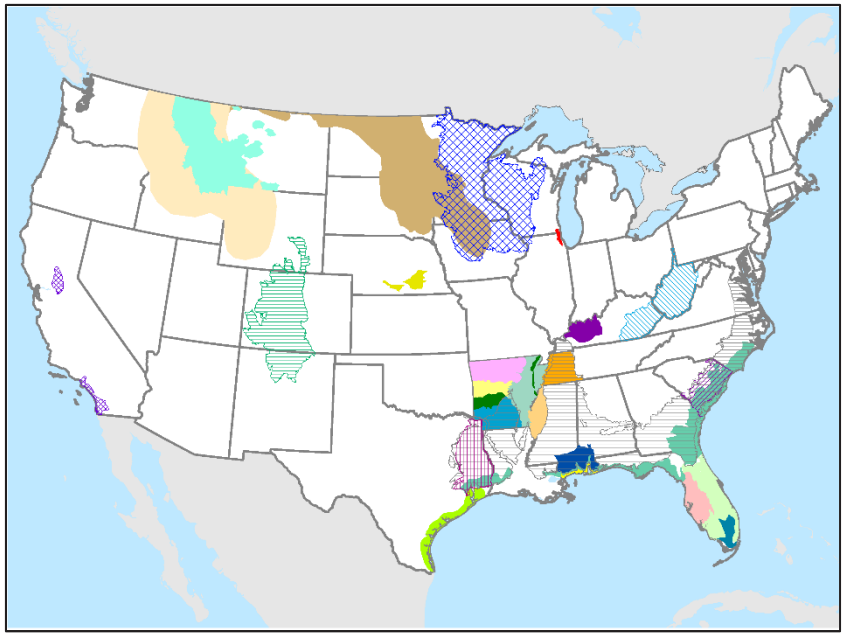
WETLAND ASSESSMENT METHODS | CHALLENGE

1. Support CWA objectives
2. Support 2008 Mitigation Rule
   - baseline and post-project assessments
   - determination of mitigation credits
   - performance standards and monitoring

All require assessing function/condition

Dozens of wetland rapid assessments methods



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WETLAND ASSESSMENT METHODS | SOLUTION

Guidance developed using:

1) input from Corps districts, other agencies and expert practitioners
2) review of dozens of existing methods
3) agency/academic expert peer review
4) alignment with stream assessment methods

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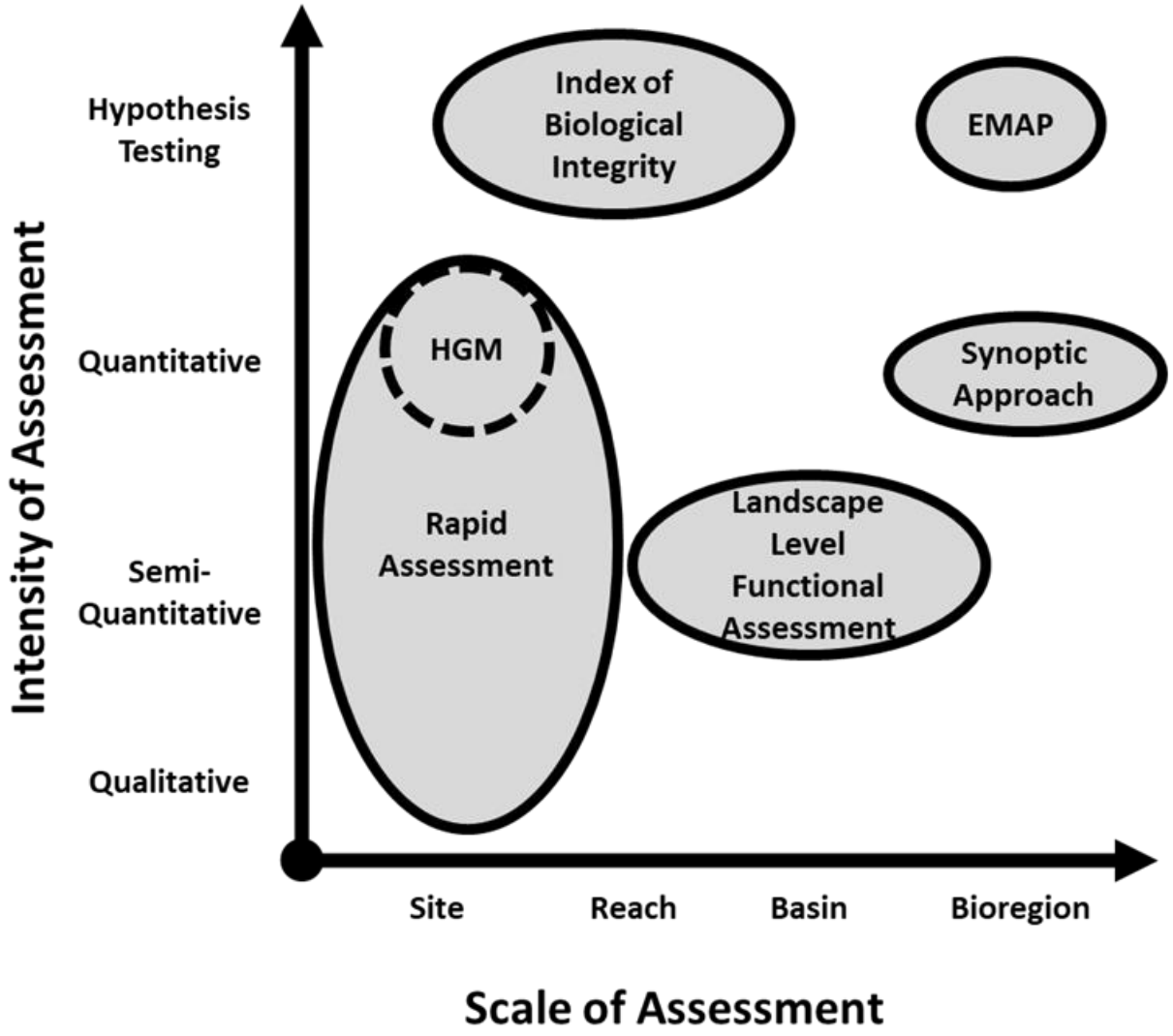
WETLAND ASSESSMENT METHODS | GUIDING PRINCIPLES

- Procedure should be well-structured
- Clear sampling protocol
- Generally, require a site visit to conduct the assessment
- Rapid data collection and analysis
- Application possible throughout the growing season
- Repeatable and confirmable results
- Transparent scoring system
- Defensible outcomes supported by peer-reviewed documents

WETLAND ASSESSMENT METHODS | APPROACH



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WETLAND ASSESSMENT METHODS | APPROACH

- Nine phases
- Iterative where necessary

Phase 1	**Interagency, multidisciplinary teams**
A multidisciplinary team of experts should develop new assessment methods or modify existing methods. Methods developed by multidisciplinary are preferred over methods that lack this element.	
Phase 2	**Clearly defined assessment goals and outputs that align with Regulatory program needs**
Wetland rapid assessment methods should clearly identify 1) the purpose of the method and 2) potential applications and intended uses, and produce 3) clear, usable outputs coincide with Regulatory program requirements. Methods with these elements are preferable to those that lack concise goals and outputs.	
Phase 3	**Wetland classification**
Ecosystem classification based on vegetative, hydrologic, geomorphic, or other characteristics increases the accuracy and repeatability of assessment methods by defining target ecosystems with similar structure and function. Methods with classification enable in-kind and out-of-kind comparisons and are preferred over methods lacking this element.	
Phase 4	**Defined geographic extent**
The geographic extent of rapid assessment method applications are defined using ecological/ geophysical boundaries, or geopolitical areas. Limiting the geographic region improves accuracy and efficiency by accounting for regional differences in climate, floral communities, or other factors. Methods that include this element are preferred.	
Phase 5	**Rapid application**
Wetland assessment procedures impact Regulatory program efficiency through the time required to do execute the procedure. Rapid assessment methods should require no more than one day to complete, and rapid, reliable methods are preferred for Regulatory applications.	
Phase 6	**Calibration and metric scaling based on reference data**
Properly calibrating wetland rapid assessment methods improves accuracy and applicability. Calibration includes comparing metric scores generated in areas exhibiting reference standard conditions to outputs observed across a gradient of ecosystem disturbances. Calibrated methods are preferred over methods that lack this element.	
Phase 7	**Application of numerical data based upon written protocols**
Quantitative measurements generate numerical values from continuous, categorical, and discreet data streams. Quantitative data, collected using written protocols improve the accuracy of assessments. Assessment methods utilizing numerical data are preferred over qualitative methodologies.	
Phase 8	**Verification of assessment metrics and outcomes**
Verifying wetland rapid assessment methods entails checking the logic and sensitivity of the approach to ensure that it is responsive to and generates the appropriate outcomes that would be anticipated across the range of environmental conditions observed across the applicable area. Verified methods are preferred over methods lacking this element.	
Phase 9	**Peer review and implementation**
Documenting peer review activity improves the usability, applicability, credibility, and quality of wetland rapid assessment methods. Strategic implementation plans should include training and iterative opportunities to modify the method to meet evolving Regulatory program needs. Methods that include these elements are preferred over methods that lack thorough peer review and implementation.	

WETLAND ASSESSMENT METHODS | APPROACH

2.7 Phase 7: Application of numerical data based upon written protocols

2.7.1 Description

Both numerical (i.e., quantitative) and qualitative metrics have been incorporated into wetland rapid assessment methods. Quantitative data includes measurements and estimates generating numerical values (Berkowitz et al. 2011). For example, wetland assessment protocols often utilize continuous variable measurements such as tree diameter, visual estimates of the percentage of ground vegetation cover, and remotely sensed measurements of a project area characteristics. All of these measures result in the generation of numerical data. Quantitative data also include discreet variables such as counts of vegetation species within a defined area or the number of layers of vegetation (Smith and Klimas 2002). These discreet variables result in the generation of numerical data. Both continuous and discreet numerical variables can be categorized in order to increase efficiency and simplify data interpretation. For example, Murray and Klimas (2013) describe methods for determining the extent of potential ponding as a measure of microtopographic relief. The ponding variable begins with an estimate of the percentage of the assessment area surface having microtopographic depressions and vernal pool sites capable of ponding rainwater, generating numerical data (e.g., 40%). The estimate is based upon either the presence of water immediately following an extended rainy period, or indicators such as water-stained leaves or changes in ground vegetation cover during dry periods. The quantitative, numerical measurement is then translated into a categorical variable (Table 1; 40% ponding yields a metric score of 1.0). This approach is efficient and makes data easy to interpret. This approach also facilitates the production of consistent results among users (Berkowitz et al. 2011). The technique of grouping or categorizing numerical data is widely applied (Daubenmire 1959; Floyd and Anderson 1987) and Fennessy et al. (2004) suggests that categorizing assessment components derived from numerical data dampens variability among users resulting in a more robust methodology.

2.7.2 New method development

The development of new wetland rapid assessment methods should utilize numerical data, develop a detailed written and published protocol, and incorporate a site visit (where possible) during normal application because those elements result in more accurate and defensible assessments in the context of the Regulatory program. Both onsite and offsite measurements should be organized into groups or categories, as appropriate, to promote efficiency and repeatability. A clear, written protocol should provide guidance on applying the method, detailing data collection and analysis, providing examples of how the results can be applied and interpreted, and identifying any temporal assessment windows.

2.7.3 Evaluating existing methods

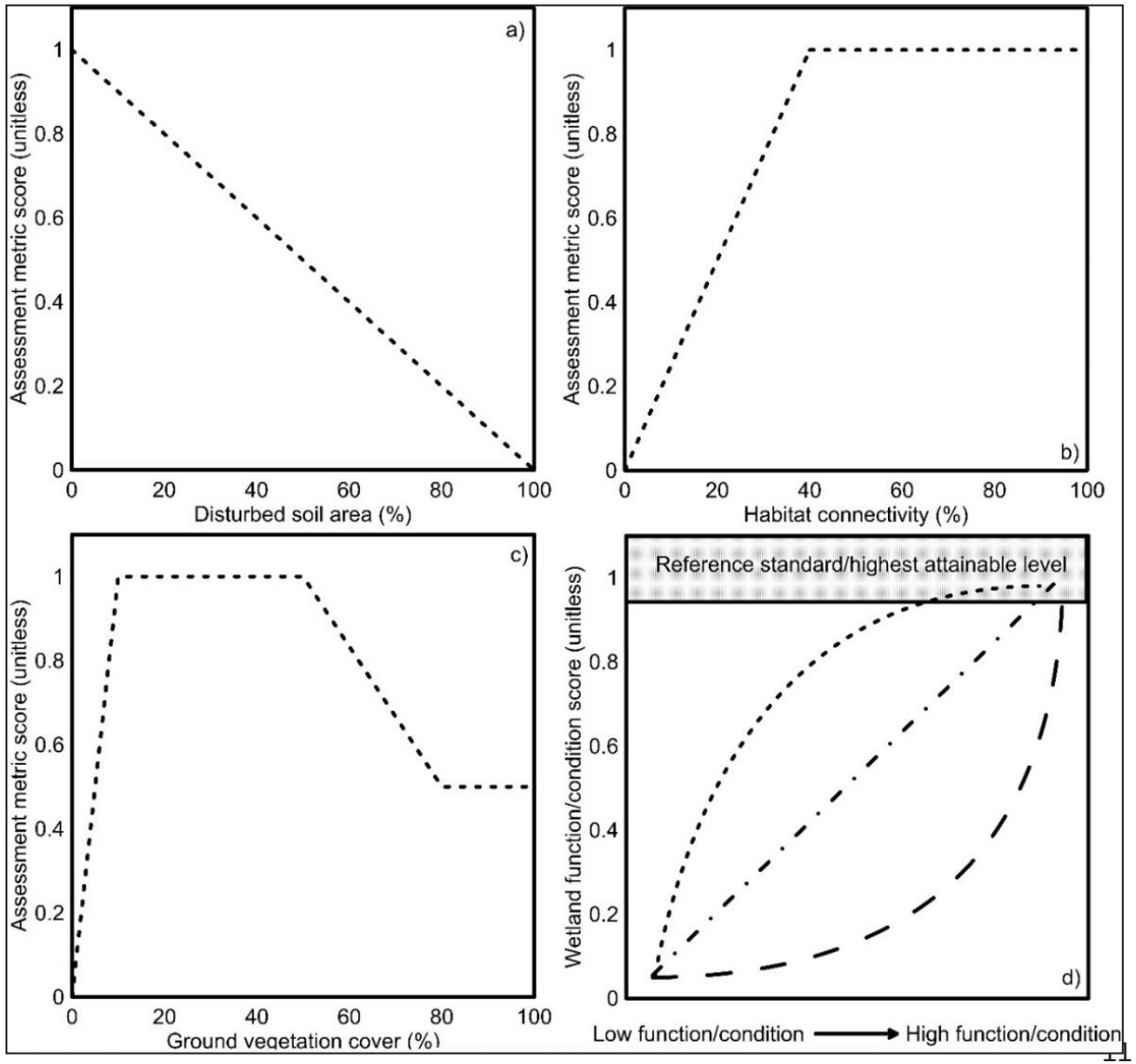
Rapid wetland assessment methods that utilize numerical variables (linear, discreet, or categorical) linked with quantitative data are preferred over methods that lack this element. Additionally, written protocols clearly meeting requirements of the Regulatory program are preferred over methods lacking a direct link with the program requirements. In general, methodologies that require a site visit are preferred over those based solely on remotely sensed metrics.

2.7.4 Modifying existing methods

In instances where narrative statements or the presence/absence of ecosystem stressors form the basis of the assessment method, quantitative data can be used to improve the accuracy and defensibility of assessment results. In many cases, a small amount of well documented data strategically gathered across reference sites exhibiting a gradient of altered functions or conditions can provide a defensible basis for modifying existing methods (Smith et al. 2013) or for defining the limitations of a given assessment approach for Regulatory program applications. If a wetland rapid assessment method does not include a clear, published

PHASE 6: CALIBRATION AND METRIC SCALING BASED ON REFERENCE DATA

- Many methods lack calibration or are poorly calibrated
- Calibration process is described, along with examples of how existing calibrations can be improved
- Sensitivity analysis and other approaches introduced



PHASE 7: APPLICATION OF NUMERICAL DATA BASED UPON WRITTEN PROTOCOLS

Table 3. Examples of qualitative narrative descriptors and numerical thresholds used in a rapid wetland rapid assessment method (adapted from Wardrop et al. (2007)

Qualitative narrative descriptors
• Excessive density of aquatic plants or algal mats in water column • Excessive deposition or dumping of organic waste • Severe vegetation stress • Obvious increase in concentration of dissolved salts • Excessive herbivory • Heavy or moderately heavy cover of algal mats • Excessively clear water • High concentration of suspended solids in water column • Significant increase in water temperature
Quantifiable numerical thresholds
• Dominance (>50% cover) of sediment tolerant vegetation • Dominance (>50% cover) of exotic or invasive plant species • Tree cutting (>50% canopy removed)

WETLAND ASSESSMENT METHODS | STATE OF NEW YORK

Reviewed NYRAM, Ohio VIBI, ORAM & HGM

Include 3 functional suites, Rapid (1 day or less), Cover multiple wetland types, except tidal wetlands.

Analyzing data to test potential metrics in Summer of 2025.

Here

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Wetland Classification Summer 2024

Apply to all of NY State, except for tidal areas.

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WETLAND ASSESSMENT METHODS | NEW ENGLAND

STREAM ASSESSMENT METHODS | OHIO

Category	Function	Description	Physical	Chemical	Biological
Hydrology	Catchment hydrology	Alters water quantity and quality through land uses, integrating typical flow duration, flow alteration (e.g., withdrawals, dams), and surface water storage.	D	*i*	*i*
	Reach inflow	Addresses localized inputs from tributaries, ditches, and pipes.	D	*i*	
Hydraulics	Flow dynamics	Describes flows across low flows to high flows, ensuring habitat availability, water quality, and influencing erosion and channel maintenance.	D	D	*i*
	Floodplain connectivity	Enhances nutrient cycling and habitat availability via water exchange.	*i*	D	D
	Hyporheic connectivity	Addresses surface-subsurface connections important for temperature regulation, nutrient dynamics, and food webs.	*i*	D	D
Geomorphology	Sediment Transport Dynamics (Channel Evolution and Stability)	Addresses sediment movement and deposition, influencing channel evolution, streambank stability, lateral migration, and habitat conditions.	D	D	*i*
	Large wood	Enhances habitat complexity and streambank stability.	*i*		D
	Bed composition	Supports aquatic habitats through streambed material and bedform dynamics.	D		D
Physicochemical	Light and thermal regime	Regulates water chemistry, drives carbon sources and dynamics, and governs the breadth of niche space available for organisms.		D	*i*
	Carbon processing	Dictates availability of energy sources and supports food webs with ties to pH, production, respiration, and overall system metabolism.		*i*	D
	Water and soil quality	Indicates the fate and transport of contaminants or other focal constituents (e.g., nitrogen & phosphorous)		D	*i*
Biology	Habitat provision	Supports diverse niches for a range of life stages of aquatic & riparian taxa.			D
	Community dynamics	Facilitates balanced assemblages composed of native taxa with minimal invasive species dominance and representation of keystone species, ecological engineers, and other functionally important taxa.		*i*	D
	Watershed connectivity	Facilitates colonization dynamics and capacity to recover after disturbance.	D		D

WETLAND ASSESSMENT METHODS | TAKE AWAY

- Method development, evaluation, and modification
- High degree of variability within a given geographic area and across wetland types
- Flexibility to remain robust and practical and be adaptable for other regions or wetland classes
- Not all phases applicable or appropriate in all cases
- Does not preclude the application of more intensive assessment methodologies or data collection
- Wetland rapid assessment methods should utilize the best available methodologies
- Intended to yield the most accurate, consistent, and defensible outcomes possible

WETLAND ASSESSMENT METHODS | ACKNOWLEDGEMENTS

The content of this report was conceptualized and developed with input from several individuals instrumental to the development of wetland assessment methods over the past ***four decades***.

- Mr. Chris Noble (USACE, retired and deceased)
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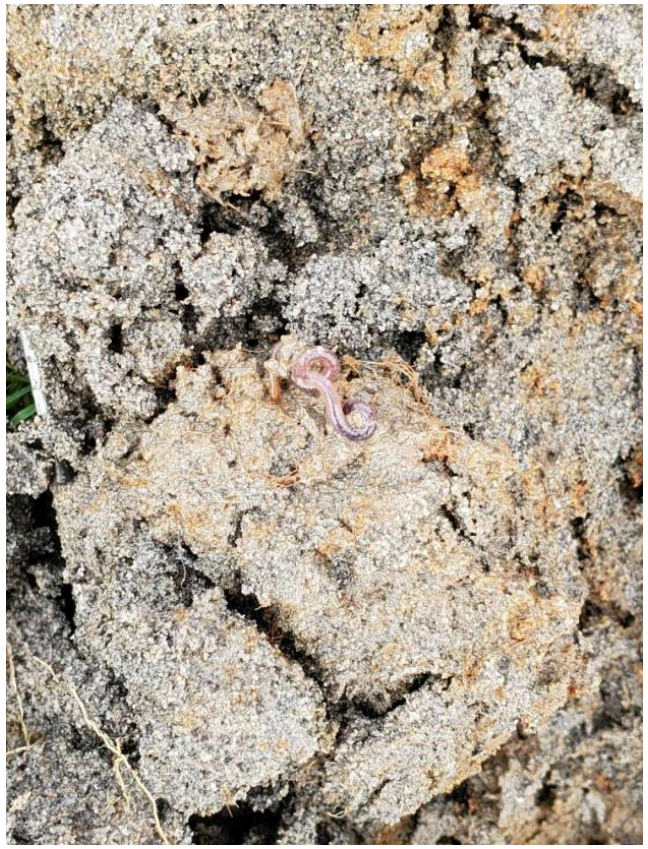
- Dr. Mark Brinson (USACE, retired and deceased)
- Dr. Dan Smith (USACE, retired)
- Dr. Eric Stein (Southern California Coastal Water Research Project)
- Dr. Siobhan Fennessy (Kenyon College)
- Dr. William Kleindl (Montana State University)
- Dr. Thomas Roberts (Tennessee Tech University, Emeritus)
- Mr. Bill Ainslie (US Environmental Protection Agency)
- Dr. Brad Johnson (Johnson Environmental Consulting, LLC)

QUESTIONS



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