An Introduction to the Wetland Assessment Tool for Condition and Health

Joshua Moody*, LeeAnn Haaf, Ella Rothermel

Partnership for the Delaware Estuary
110 S. Poplar St
Wilmington, DE 19801
*jmoody@delawareestuary.org

Partnership for the DELAWARE ESTUARY

Goal

Standardize decision-making steps for salt marsh intervention projects in the U.S. Mid Atlantic

Background

The Wetland Assessment Tool for Condition and Health (WATCH) establishes a common approach for users to identify site-specific issues and determine if those issues merit intervention. The framework integrates existing tools, data, and field methods to improve site assessment practices. This tool will foster consistency among the different types of professionals engaged in salt marsh projects. **This tool seeks to standardize the use of data streams so individuals can perform consistent, scientifically defensible site assessments.** Eventually, this framework will be used to help match appropriate tactics to salt marshes in need of intervention.

Users: scientists, engineers, municipalities, property owners, regulatory agencies

1. How can we approach site assessment to guide restoration decision making in a common manner?

A) Identify marsh attributes that are fundamental to marsh function (Figure 1).

B) Review methodologies used to assess the various metrics that constitute each attribute (Table 1). Metrics have associated methods that are used to collect site-specific data.

C) Develop a system where practitioners use data from an array of methods to answer specific questions about marsh condition or function (Figure 2).

D) Create a template for practitioners to compare site specific data to existing data (i.e. criteria). Data collected for each metric are determine to meet or exceed criteria thresholds.

E) Integrate metric results for a holistic picture of marsh condition or function.

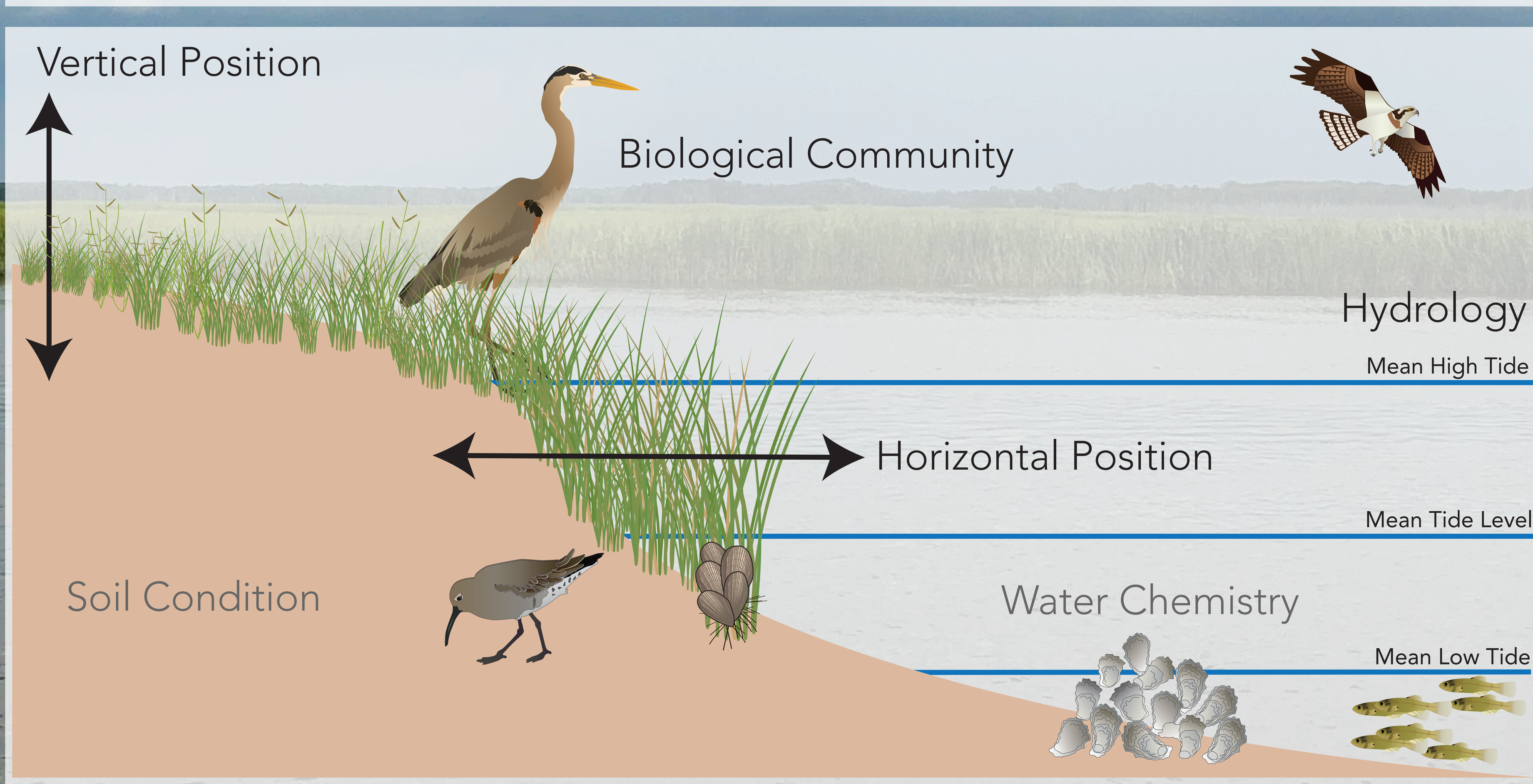

Figure 1. We identified six key attributes that were fundamental to marsh function. These attributes contain metrics which are consistently used in marsh studies.

2. Criteria - reference data

Sources: Online databases, scientific or peer reviewed literature, agency reports, institutional knowledge.

Quality criteria: Known values; published; "what we *need* to achieve"

Mean criteria: Thresholds based on dataset averages local or relative data distributions; typical observations; "what we *should* achieve"

Target criteria: Value for which to aim; "what we *want* to achieve"

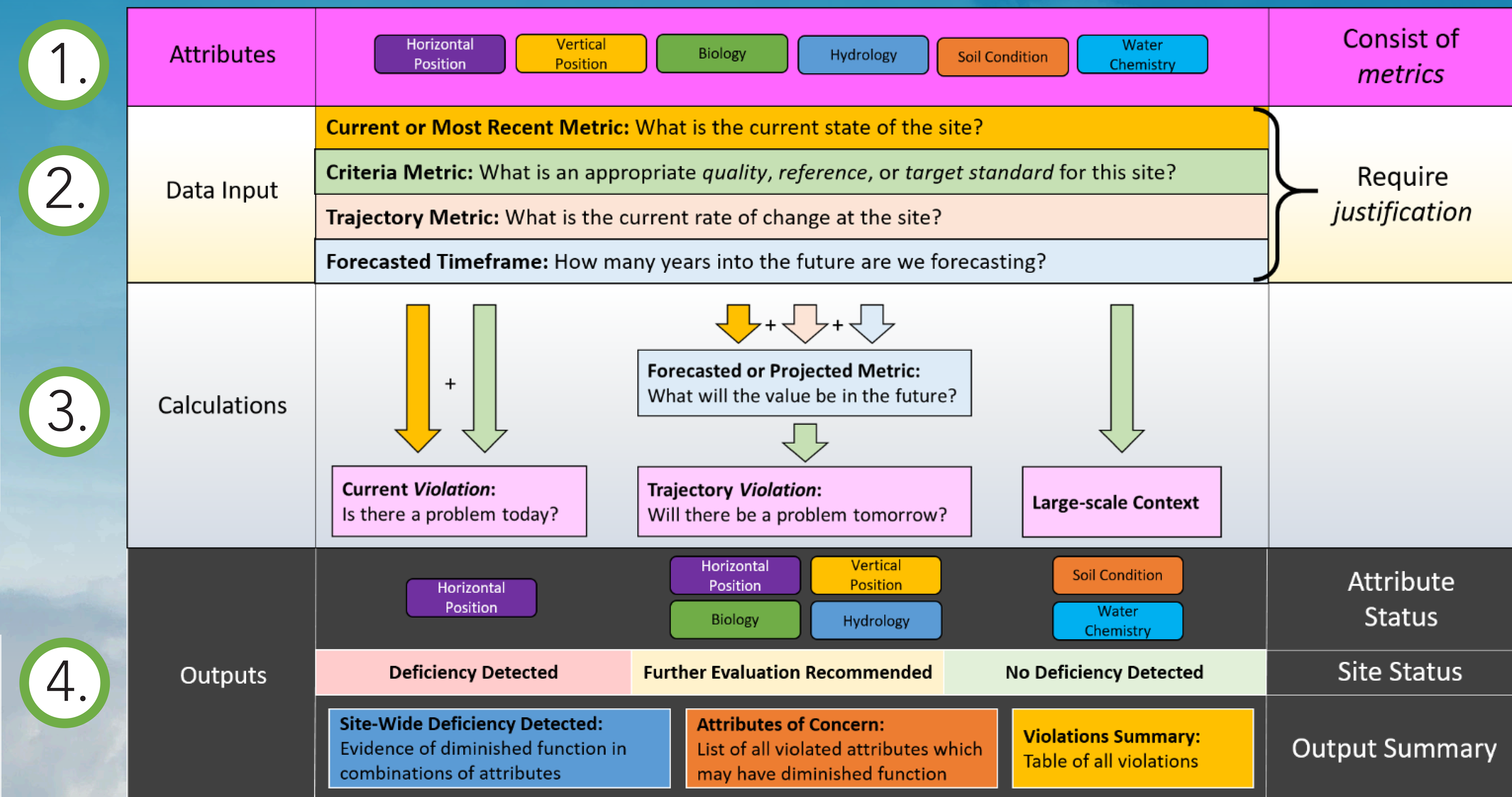

Figure 2. Steps of the WATCH site-based decision tool.

SCAN ME

Get the WATCH Excel-based template and the user guide from our website!

Table 1. An example table which lists methods and criteria for select metrics in the Hydrology Attribute.

Hydrology Attribute			
Metric	Importance	Methods / Method Sources	Criteria / Criterion Sources
EXAMPLE Inundation duration	Relates to plant production, ribbed mussel feeding time	water level loggers deployed in tidal channels (units: % of time inundated at a specific elevation)	MEAN STANDARD: high marsh <36%, low marsh >45%, <70%; tidal flat >65% (source: a report on ribbed mussel feeding time potential[3])
EXAMPLE Hypsometry[1]	Relates to elevation capital	Elevation surveys (units: m MHW)	QUALITY STANDARD: >33% of surveyed area above MHW (work by Raposa et al. 2016[4]: "MARS" index)
EXAMPLE Ditches	Impacts inundation frequency	Aerial map delineation (units: linear meters of ditch, or % excavated area[2])	TARGET STANDARD: 0 linear m of ditches >2 m wide; <3% area draining through excavated ditches

3. Attribute Integration

Attributes will be integrated using a Boolean algebra approach: True (1) or False (0). Data will meet, or NOT meet criteria thresholds. Relationships among attributes can be established using: AND, OR, & NOT.

Final integration is a combination of relationships among attributes, for example:

Vertical Position NOT Hydrology OR Biological Community

Hydrology AND Vertical Position NOT Biological Community

Temporal Dimensions

Many metrics are assessed using one-time surveys, but the long term prognoses depend on how many processes interact over time. Most attributes, notably Vertical and Horizontal Positions, can be assessed through time. Marsh persistence can be determined by tracking changes in condition over time. This is referred to as the marsh's trajectory; concepts of trajectory include estimates of sea level rise and persistent erosion.

4. Site Status

Attribute integrations each have an associated site status: no deficiency detected, further evaluation recommended, and no deficiency detected.

No deficiency detected: Output indicates that ALL Attributes received a "true" score. No metrics surpassed Criteria thresholds, no violations. No evidence that the site is deficient for any metrics.

Further evaluation recommended: Output indicates that SOME Attributes received a "false" score. Metrics that surpassed Criteria thresholds are recommended for further monitoring. Evidence that the site *might* have deficiencies. Need to further assess trajectory.

Deficiency detected: Output indicates that the COMBINATION of Attributes received a worrisome "false" score. Evidence that the site is deficient or unlikely to persist. Trajectories suggest marsh loss before a predetermined time point (e.g. end of the century).

Additionally, The Interpretive Guidance section provides the user with troubleshooting advice, data exploration ideas, and anecdotes to support the synthesis of thoughtful conclusions from WATCH outputs

Acknowledgments

This work was supported by a National Fish and Wildlife Foundation's Delaware Watershed Conservation Fund Grant No. 0403.19.065232. Previous versions of the WATCH were supported by US EPA Region 2 Wetland Program Development Grant award to NJDEP Office of Coastal and Land Use Planning. We are deeply grateful for this funding. Special thanks to Kathleen Drake and Irene Purdy. We wish to extend thanks to our numerous partners, which have shaped our understanding of marsh condition and function. This work would not be possible without the vast community of individuals dedicated to preserving New Jersey's coastal resources. You continue to inspire us!

1. Hypsometry is defined as the measurement of land elevation above mean sea level.
2. Mid Atlantic Tidal Rapid Assessment (MidTRAM) v4.0. 2017. < http://www.dnrec.delaware.gov/Admin/DelawareWetlands/Documents/Tidal%20Rapid_Protocol%203.0%20Jun10.pdf>
3. Haaf, L., E. Reilly, A. Padeletti, M. Maxwell-Doyle. D. Kreeger. 2016. Planning for the Next Big Storm: Wetland Shoreline and Coastal Resilience Planning for Strategic Investment. PDE Report 16-07. 51 pp
4. Raposa, K. B. K.Wasson, E. Smith, J. A. Crooks, P. Delgado, S. H. Fernald, M.C. Ferner, A. Helms, L. A. Hice, J. W. Mora, B. Puckett, D. Sanger, S. Shull, L. Spurrier, R. Stevens, S. Lerberg. 2016. Assessing tidal marsh resilience to sea-level rise at broad geographic scales with multi-metric indices. Biological Conservation(204): pg 263-275. https://doi.org/10.1016/j.biocon.2016.10.015.