A crosswalk of PDE and EPA tools for wetland assessment

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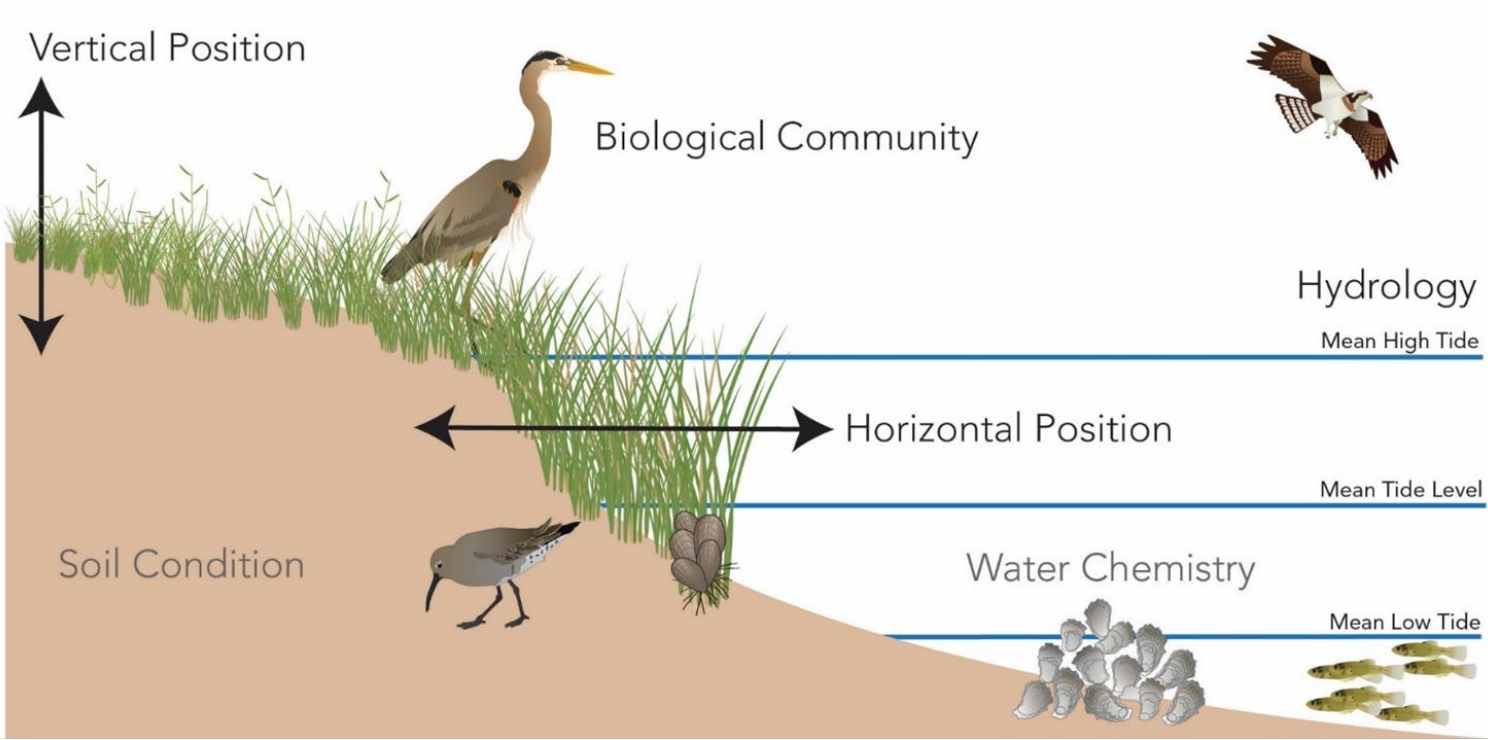Center for Public Health and Environmental Assessment

Overview

This talk will explore:

▶ PDE's Wetland Assessment Tool: Condition and Health

▶ Complementary EPA tools to use in concert
- Example 1: Relative Wetland Vulnerabilities Framework
- Example 2: Adaptation Design Tool

▶ A crosswalk of terminology, attributes, metrics and steps between two of the tools

▶ Conclusions

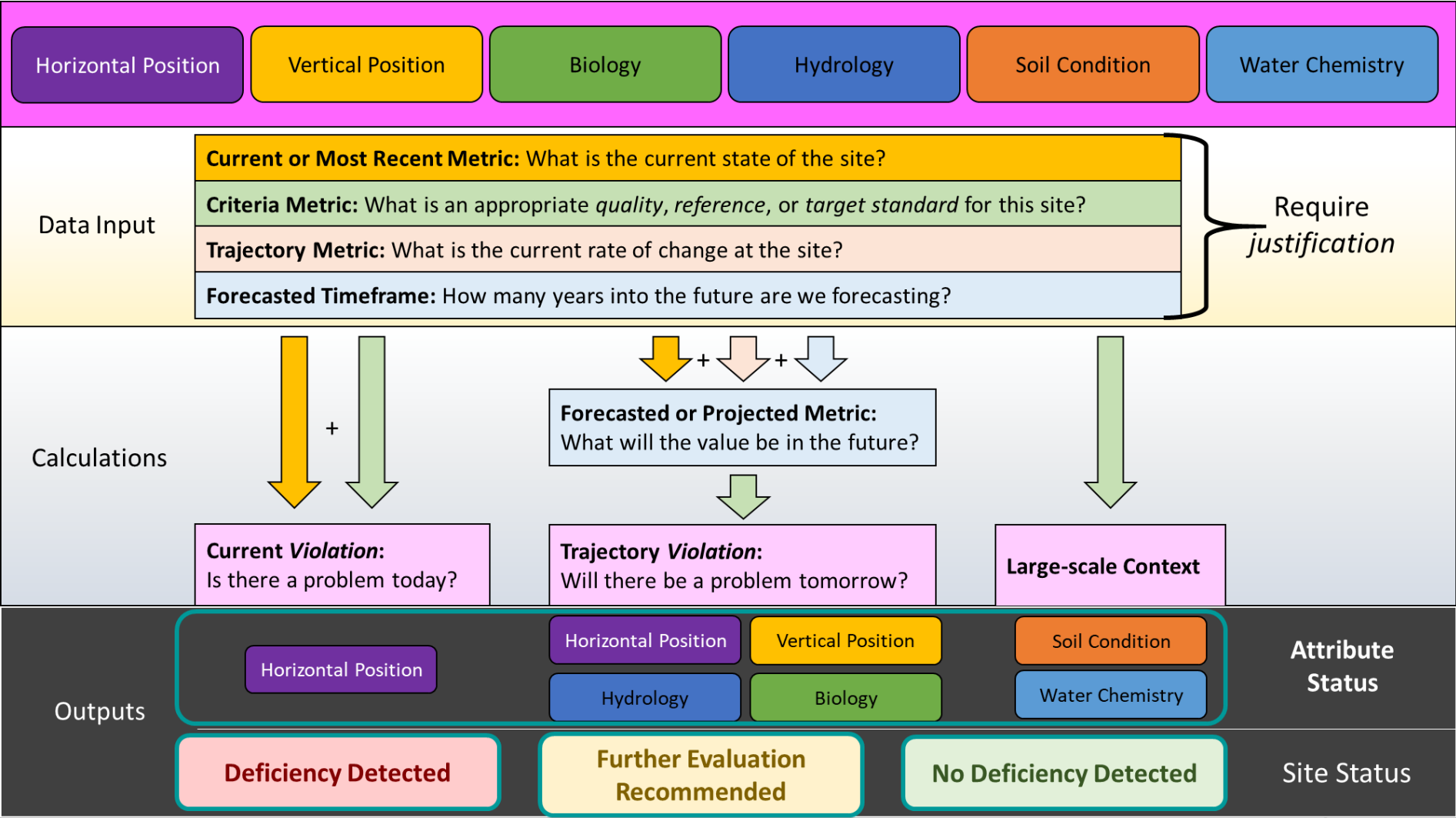# PDE Wetlands Assessment Tool: Condition and Health (WATCH)

Track Outcome → Symptom → Evaluation → Diagnosis → Prognosis → Treatment

Erosion, Bioturbation, grazing?

Elevation, Waterlogging, Scour?

Erosion only or with Biological Issue?

Ponding? Stable or Expanding?

WATCH assumptions

Vertical Position

Biological Community

Hydrology

Mean High Tide

Horizontal Position

Mean Tide Level

Soil Condition

Water Chemistry

Mean Low Tide

It is key that we describe these Attributes using the best and most appropriate Metrics

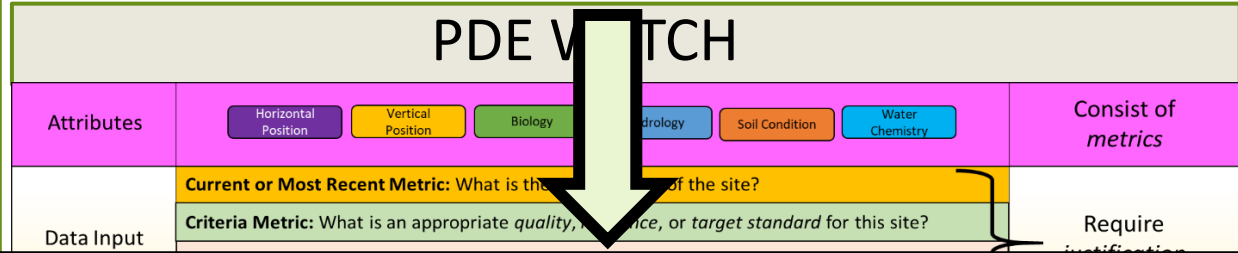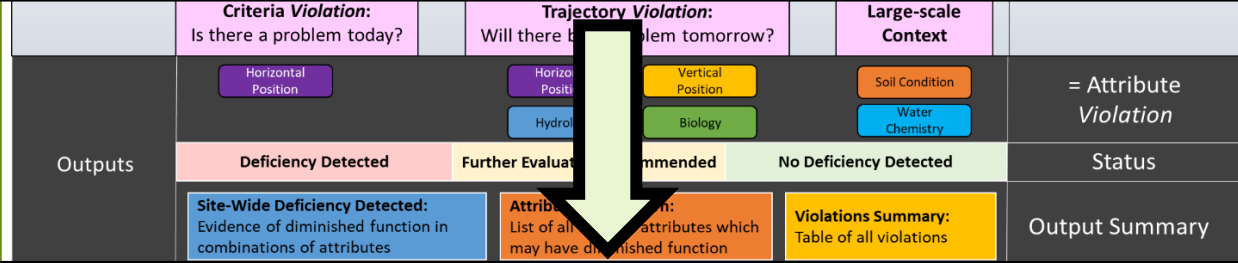**These should be gathered using the established Methods**

WATCH flow

Data Input

Current or Most Recent Metric: What is the current state of the site?	
Criteria Metric: What is an appropriate *quality*, *reference*, or *target standard* for this site?	Require *justification*
Trajectory Metric: What is the current rate of change at the site?	
Forecasted Timeframe: How many years into the future are we forecasting?	

Calculations

Forecasted or Projected Metric: What will the value be in the future?

Current *Violation*: Is there a problem today?

Trajectory *Violation*: Will there be a problem tomorrow?

Large-scale Context

Outputs

Horizontal Position | Vertical Position | Soil Condition | Hydrology | Biology | Water Chemistry

Attribute Status

Deficiency Detected | **Further Evaluation Recommended** | **No Deficiency Detected**

Site Status

5

Using multiple tools in concert

Level 1: Site Prioritization
Where should we focus resources (dependent on goals)?

PDE WATCH

| Attributes | Horizontal Position | Vertical Position | Biology | Hydrology | Soil Condition | Water Chemistry | Consist of *metrics* |

Data Input
Current or Most Recent Metric: What is the ... of the site?
Criteria Metric: What is an appropriate *quality*, *... nce*, or *target standard* for this site?
Require *justification*

Level 2: Site-specific Issue Diagnosis
What is the problem and where is it located?
Is the problem occurring now or upcoming?
WATCH: Wetland Assessment Tool: Condition & Health

Criteria *Violation*: Is there a problem today?	Trajectory *Violation*: Will there be a problem tomorrow?	Large-scale Context	
Horizontal Position	Horizontal Position / Vertical Position	Soil Condition	= Attribute *Violation*
	Hydrology / Biology	Water Chemistry	

Outputs
| Deficiency Detected | Further Evaluation Recommended | No Deficiency Detected | Status |
| Site-Wide Deficiency Detected: Evidence of diminished function in combinations of attributes | Attribute ...: List of all ... attributes which may have diminished function | Violations Summary: Table of all violations | Output Summary |

Level 3: Issue-specific Tactic Selection
What method will address the issue today and tomorrow?

Design Considerations

Vulnerability & resilience potential information

change on target stressor(s)

change on management actions

MANAGEMENT ACTIONS

EPA Relative Wetland Vulnerabilities Frame...

EPA Adaptation Design Tool

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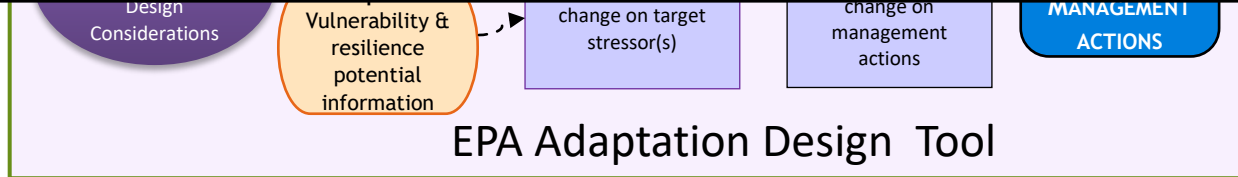
Example 1: EPA Relative Wetland Vulnerabilities Framework (RWVF)
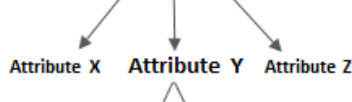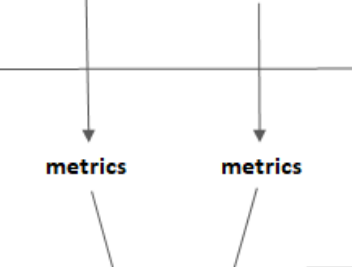

| Steps/Intent	Conceptual Diagram
Define the ecological and decision contexts	
01 Classification 1 **Classification:** Identify the target population or units of focus for assessing relative vulnerabilities	Wetland Type A, Wetland Type B, Wetland Type C
02 Attribute Selection 2 **Attributes:** Define what is to be measured and why	Attribute X, Attribute Y, Attribute Z
03 Principal Factors 3 **Principal Factors:** Determine factors that influence the dynamics of the selected wetland attribute(s)	Exposure, Response (sensitivity/ adaptive capacity)
04 Metrics 4 **Metric(s):** Select exposure and corresponding response measures	metrics, metrics
05 Evaluate Relative Vulnerability 5 **Relative Vulnerability:** Create a composite of calculated metrics for assessment of relative vulnerabilities for each site	Vulnerability Profile

https://doi.org/10.1002/ecs2.2561

A framework and methodology that:

► Addresses larger-scale **site selection**

► A **top-down** approach that we seek to align with WATCH's **bottom-up** orientation

► Separately examines **exposure** and **response** components of vulnerability

► Generates vulnerability profiles that can be linked to evaluation of **management tactics** to support **adaptation**

Example 1: How the RWVF can work in conjunction with WATCH
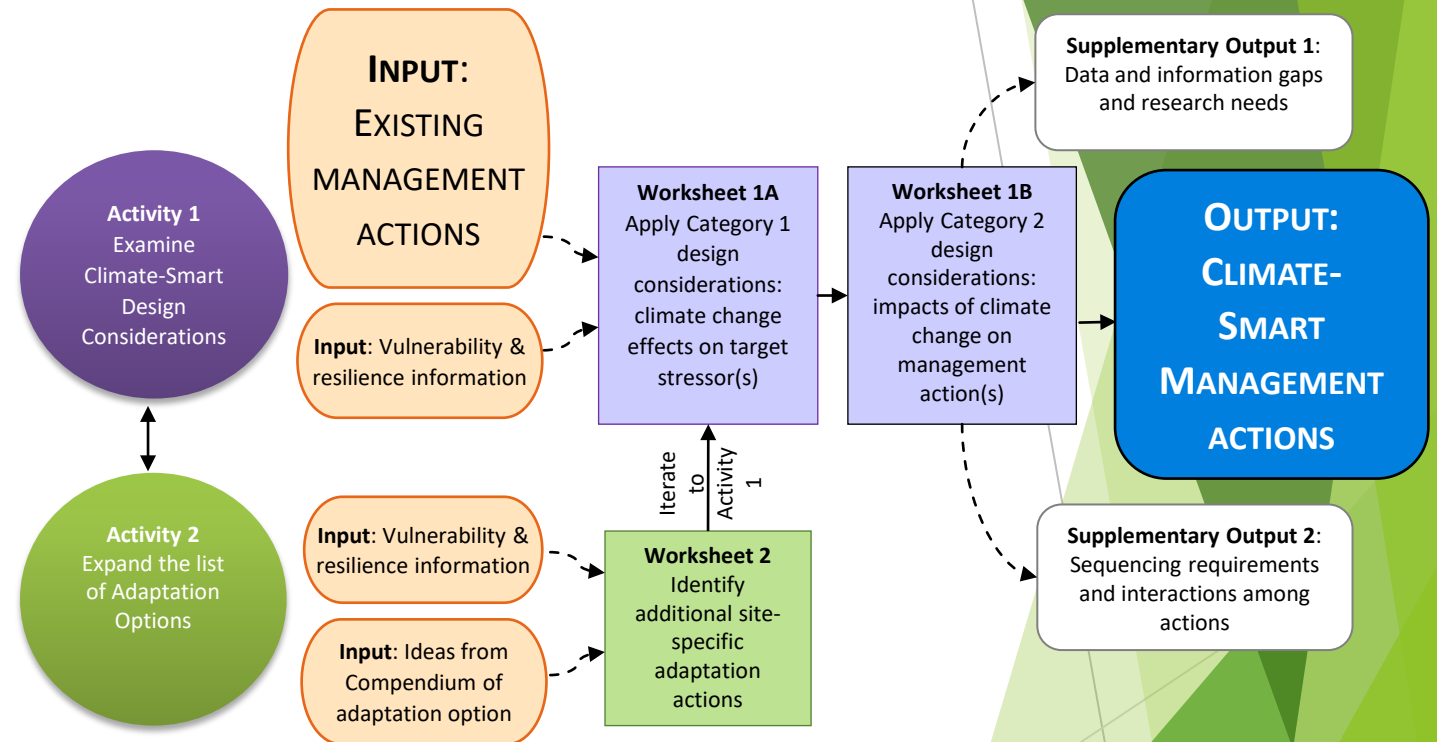

Case study areas
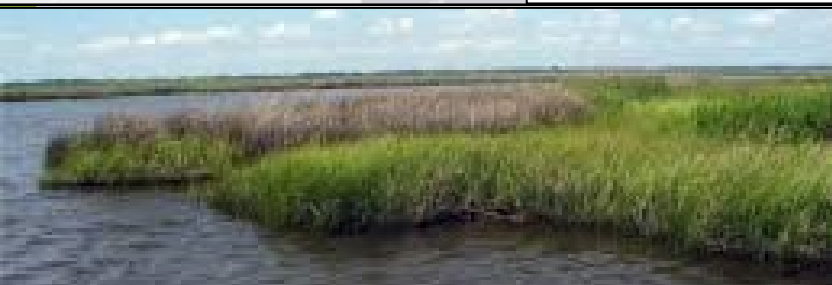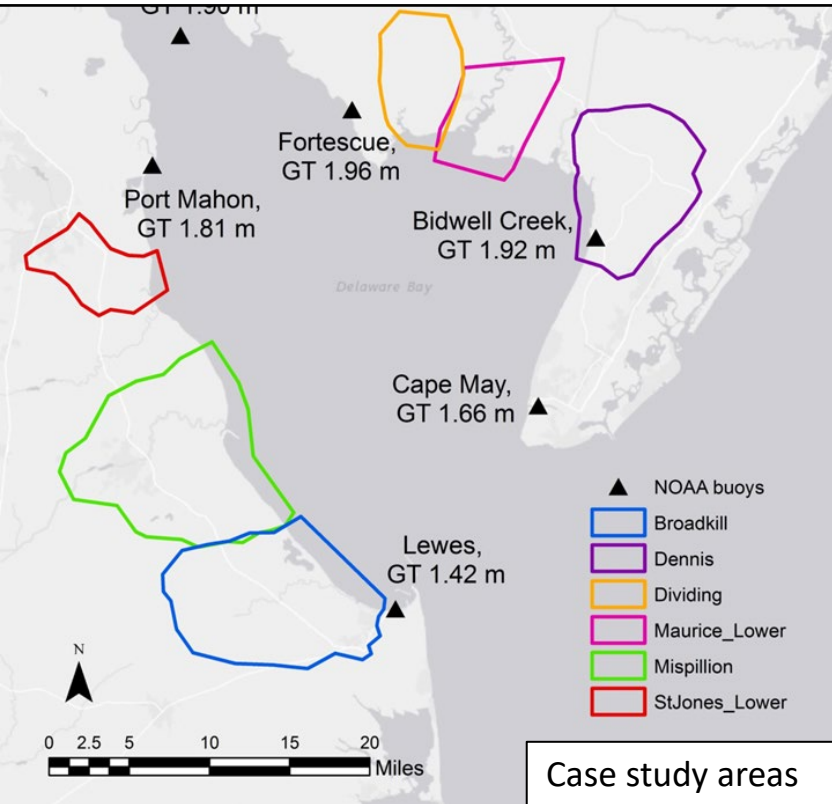
- ▶ Used the RWVF to perform a relative vulnerability assessment with components of:
  - **Exposure**: Relative Sea Level Rise (SLR)
  - **Response**: Change in marsh acreage (SLAMM)

- ▶ Results can help identify areas that are potentially suitable for management activities **both now and in the future**

- ▶ With WATCH, could aid**:**
  - **Prioritization** of sites for WATCH application
  - **Comparison** of vulnerabilities of multiple WATCH sites
  - Consideration of **within-site factors** that could affect WATCH criteria standards and trajectories

Dennis 2050
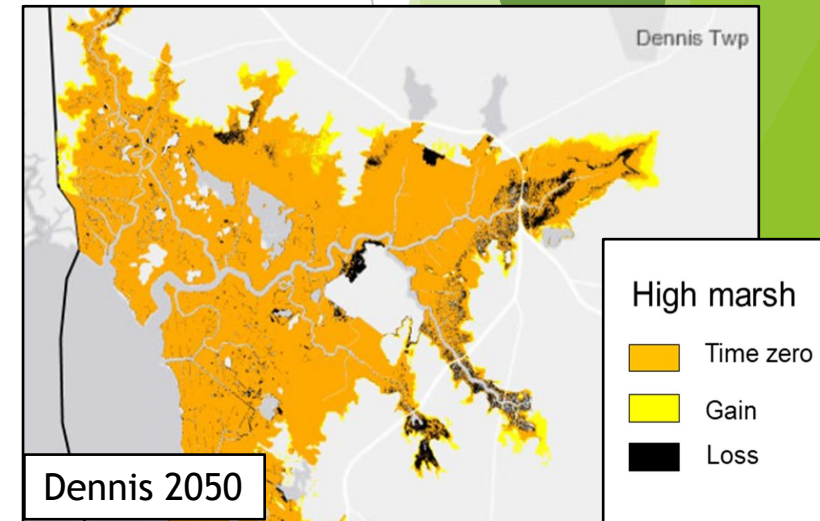
Example 2: EPA Adaptation Design Tool (ADT)

A structured approach that guides users through a series of steps to:

- Apply **climate-smart design considerations** to management tactics

- Brainstorm **additional adaptation activities** that may be critically needed

- **Identify and record** insights on:
  - ❖ Information gaps & research needs
  - ❖ Synergies, conflicts & sequencing considerations among actions

Activity 1
Examine Climate-Smart Design Considerations

Activity 2
Expand the list of Adaptation Options

INPUT:
EXISTING MANAGEMENT ACTIONS

Input: Vulnerability & resilience information

Input: Vulnerability & resilience information

Input: Ideas from Compendium of adaptation option

Worksheet 1A
Apply Category 1 design considerations: climate change effects on target stressor(s)

Worksheet 1B
Apply Category 2 design considerations: impacts of climate change on management action(s)

Iterate to Activity 1

Worksheet 2
Identify additional site-specific adaptation actions

Supplementary Output 1: Data and information gaps and research needs

OUTPUT:
CLIMATE-SMART MANAGEMENT ACTIONS

Supplementary Output 2: Sequencing requirements and interactions among actions

https://www.coris.noaa.gov/activities/CCAP_design/

Example 2: How the ADT can work in conjunction with WATCH

- For management tactics under consideration, worksheets guide a systematic process of **climate-smart design**

- Design Considerations:
  - Category 1: How will climate change directly or indirectly affect how the **stressor(s) of concern** impact the system?
  - Category 2: What are the **implications for functionality** of the management action, and how will it need to be adjusted (in terms of location, timing or structural design)?

- Can support **evaluation** of which tactics have the potential for greatest effectiveness in the face of **ongoing environmental changes**

Worksheet 1B

Category 2 design considerations: CC effects on management actions (watershed example)

B1 Action number	B2 Existing Management Action	B3 Changes in effectiveness of action due to: climate impacts on target stressors	B4 Changes in effectiveness of action due to: climate impacts on management action	B5 Timeframe or constraint for using the action and implementation (e.g., urgency, longer or shorter term)	B6 Notes	B7 What changes are needed to adapt the action (place, time, design)	B8 Climate-Smart Management Action
1	Install terraces adjacent to dirt roads	Heavy rainfall events following dry periods may overwhelm capacity of terraces	Terraces themselves could be destroyed by extreme events	Life of these practices is 5-10 yrs; need to plan ahead for strategic placement in combination with other actions	How heavy a rainfall event will destroy a standard terrace?	Need to adapt action spatially, design terraces to withstand extreme events	Install and maintain a series of terraces of sufficient capacity, resistant to extreme events and adjacent to roads prioritized as having worst erosion

Spotlight: A closer crosswalk of RWVF and WATCH

EPA RWVF

PDE WATCH
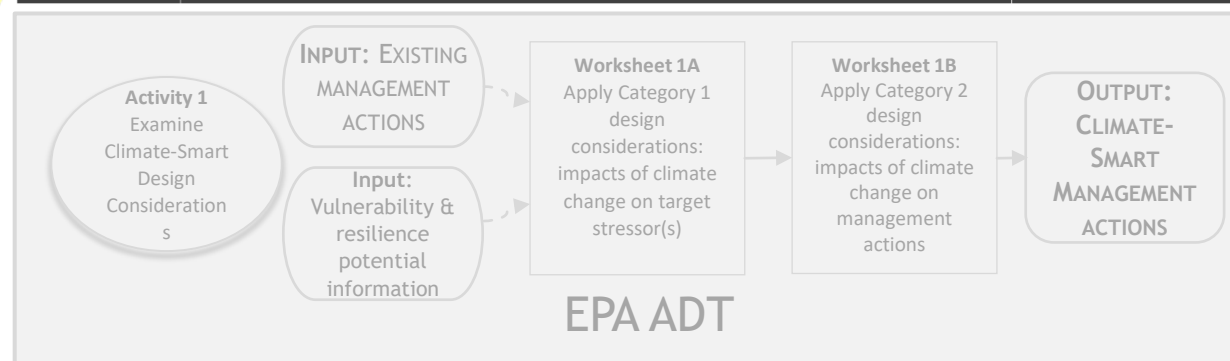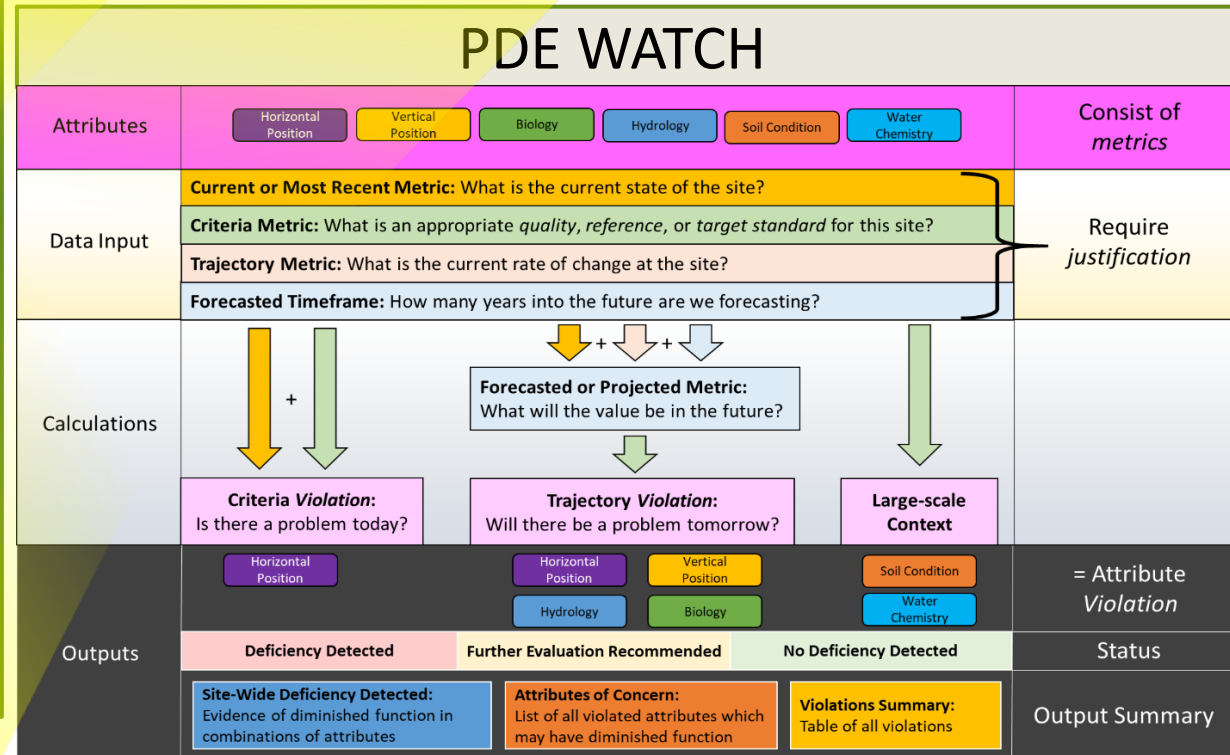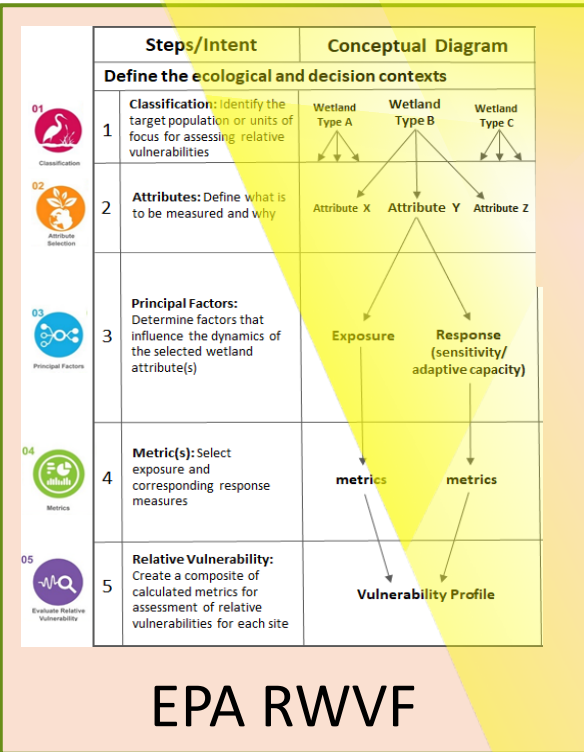
Crosswalk: WATCH and RWVF

Common themes
- Both take the user through a systematic process
- Both are very flexible

Differences –

WATCH tool is bottom up

RWVF is top down

The goal is a comprehensive assessment of the problem(s) at the site

A site has already been selected for evaluation

Spatial scale – smaller, suitable for application of management tactics

Has a SLR component, but not explicitly geared toward climate change

Differences in terminology

The goal is a vulnerability assessment to help incorporate climate change considerations into management decision making

Spatial scale – larger, more suitable for informing site selection across larger areas, but results could potentially be used when considering selection and design of intervention tactics within sites

Pilot studies have been geared toward climate change, but the method is flexible to accommodate broader consideration of conventional stressors

Differences in terminology

Crosswalk: RWVF and WATCH

RWVF Steps	WATCH - Road Flooding Example
Classification/Scenario description	Salt marsh
Attributes/Scenario description	Salt marsh acreage (or maybe just width), which provides flood protection services for the road
Principal Factors/ Attributes	Exposures: SLR, other stressors not explicitly stated (e.g., hydrologic alteration, nutrient enrichment) Responses (depends on the WATCH attribute): • Change in marsh width • Change in marsh platform elevation • Change in percent vegetation cover • Change in percent open water within marsh • Change in pNitrogen or pNitrate Modifiers: slope, tide range, salt elevation, accretion, erosion, marsh condition
Metrics/ Metric or Method, pending the Attribute	<table><tr><td></td><td>Exposure</td><td>Response</td></tr><tr><td>Horizontal position</td><td>Not sure</td><td>Marsh width (m)</td></tr><tr><td>Vertical position</td><td>SLR, plus other?</td><td>Marsh platform elevation (m MLW)</td></tr><tr><td>Biology</td><td>Not sure</td><td>Vegetation cover (%)</td></tr><tr><td>Hydrology</td><td>Not sure</td><td>Open Water within Marsh (%)</td></tr><tr><td>Water chemistry</td><td>Not sure</td><td>pNitrogen or pNitrate (no data entered)</td></tr><tr><td>Soil condition</td><td>Not applicable</td><td>Not applicable?</td></tr></table>
Relative Vulnerability/Relative violation seriousness	Could run multiple individual sites through the WATCH tool and compare results

Conclusions

▶ Site assessment and diagnosis of interacting stressors and negative system responses is an essential first step for restoration planning and design

▶ All three tools support:
- Evaluation and planning for today, but also for future conditions
- A systematic but flexible process with management-relevant outputs

▶ Complementary tools can be used at the level of large-scale site selection, within-site condition assessment, and tactic-specific climate-smart design

▶ May or may not need to delve into every tool deeply, but at a minimum can consider key concepts and address the critical ones to your case

▶ Given all the many tools and approaches out there, how can we better contextualize how they complement or align with each other so we can pick the best ones to use in each situation?