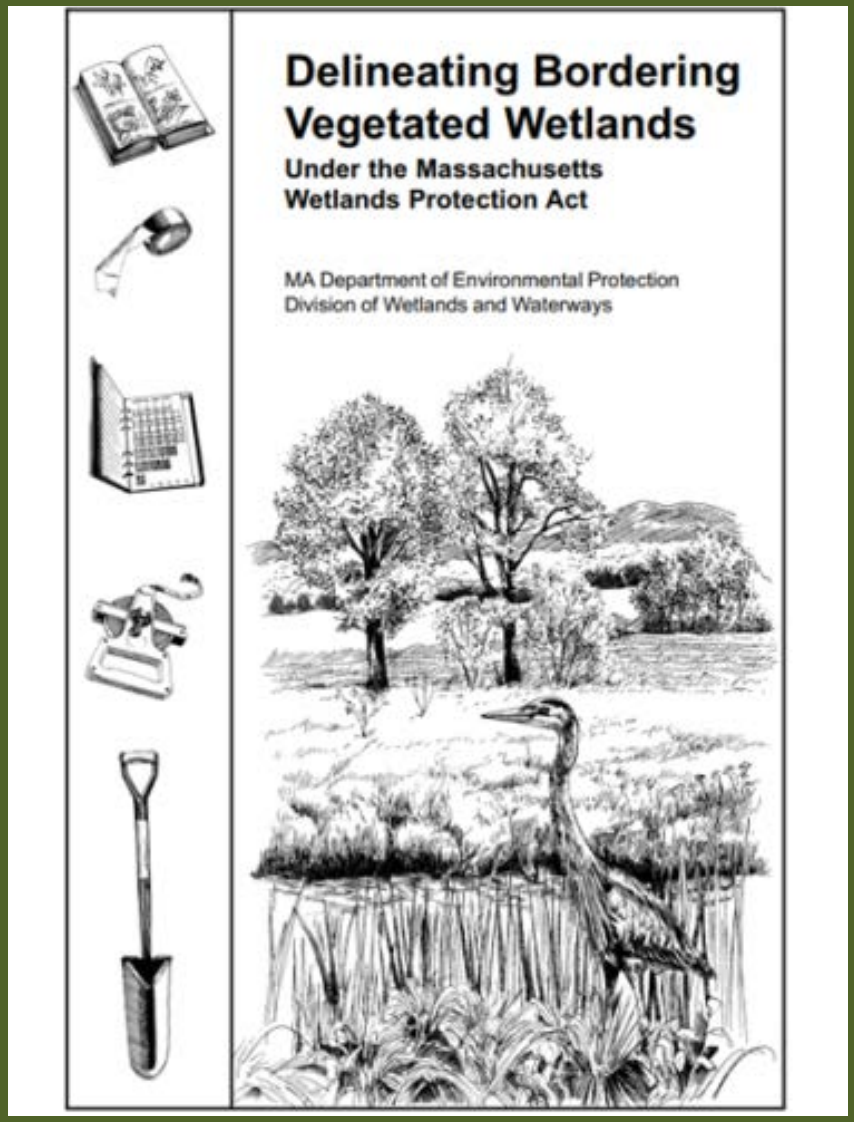
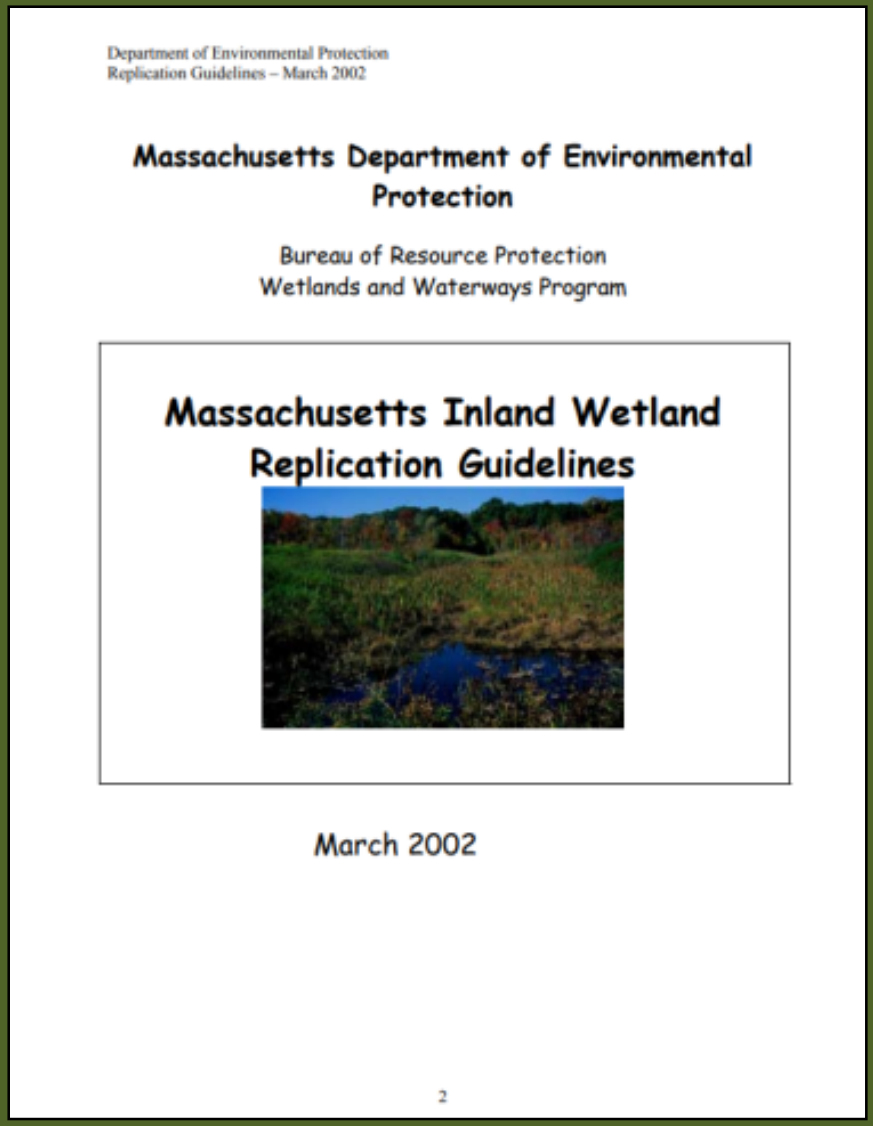
Wetland Mitigation Success Report – Next Steps, and an Update of the Bordering Vegetated Wetland Delineation and Mitigation Manuals





Wetland Replacement in Massachusetts

June 2018

Scott Jackson
UMass Amherst Center for Food, Agriculture and the Environment

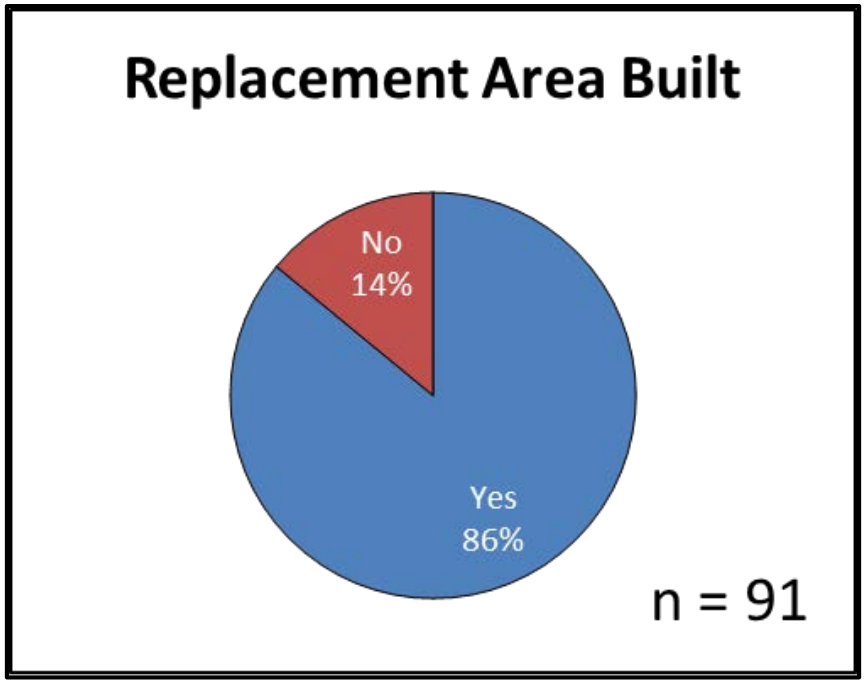
UMass Amherst

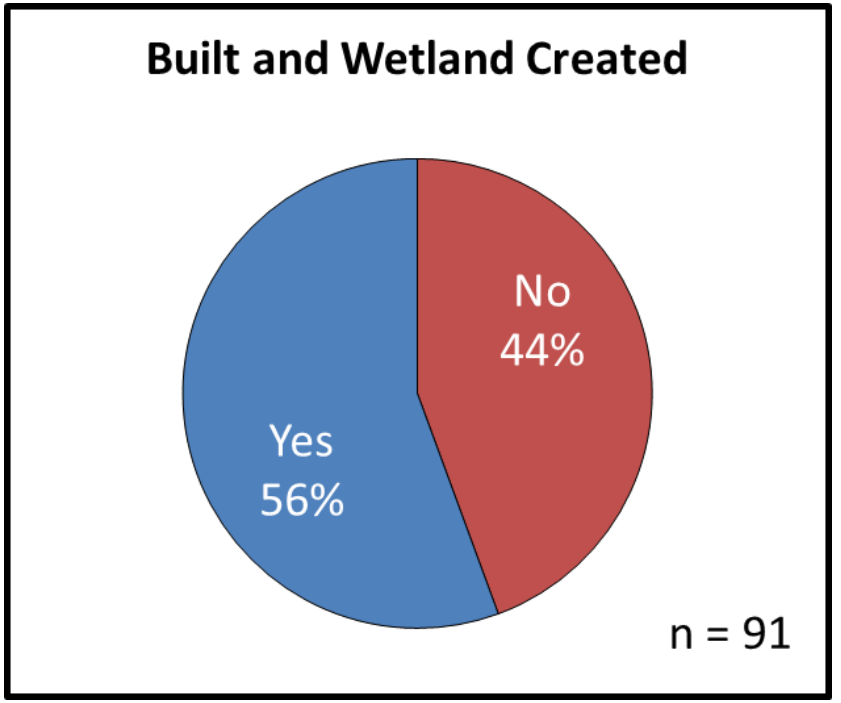
Lisa Rhodes
Mike McHugh
MassDEP Wetlands Program

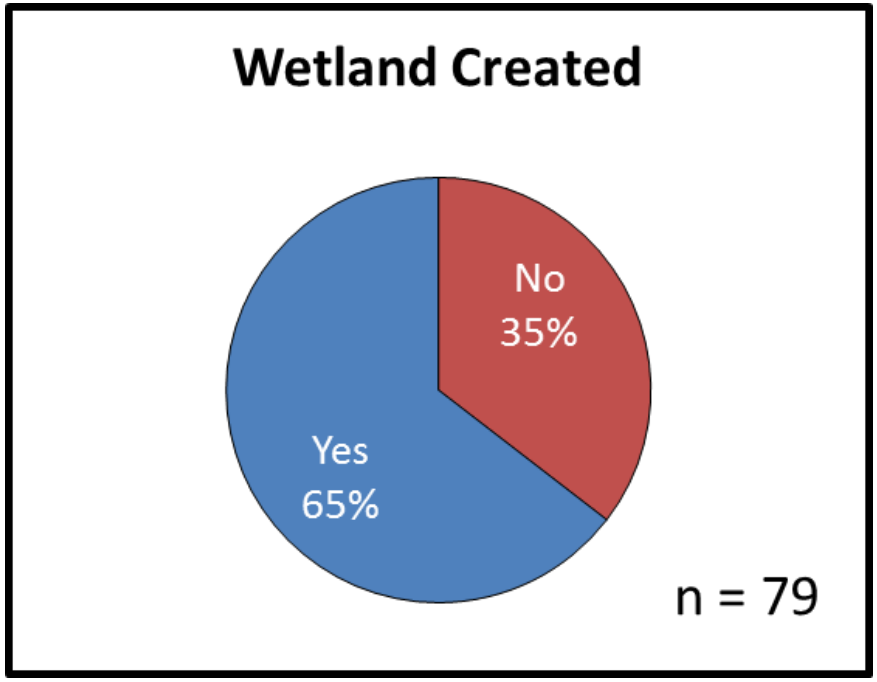
MassDEP

- Notices of Intent filed between 2004 and 2008 were analyzed in 44 randomly-selected municipalities
- Over 4,700 permit applications were reviewed
- 152 projects for which wetland replacement was proposed and/or required
- 91 project selected for analysis
  - Field evaluation for 79 projects
  - No replacement area built for 12 projects
- Mitigation success was not very good.

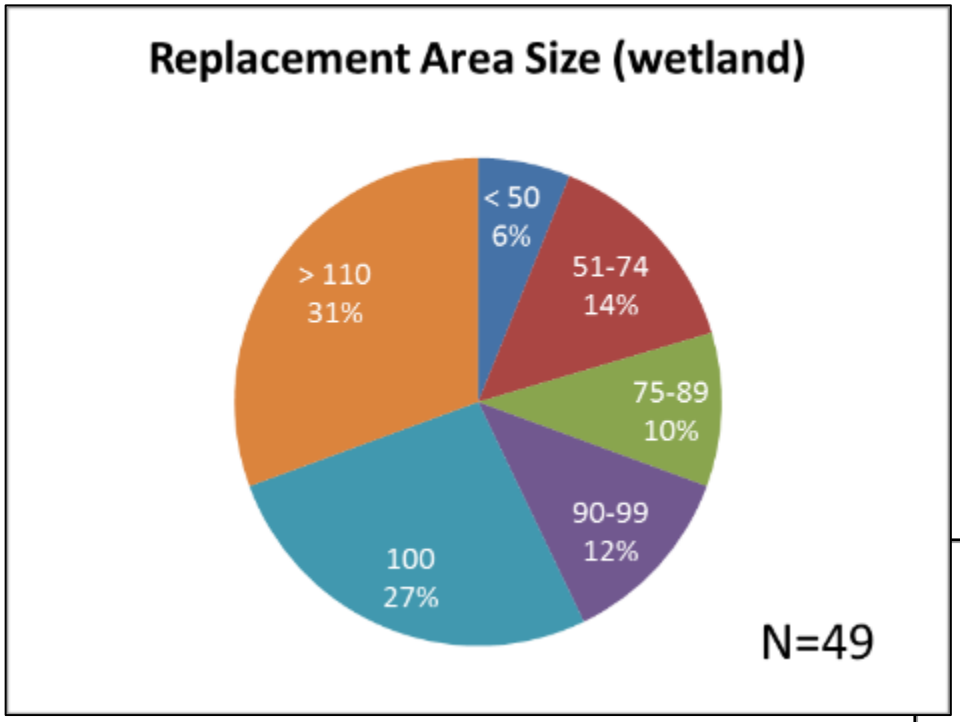
BVW Mitigation Success

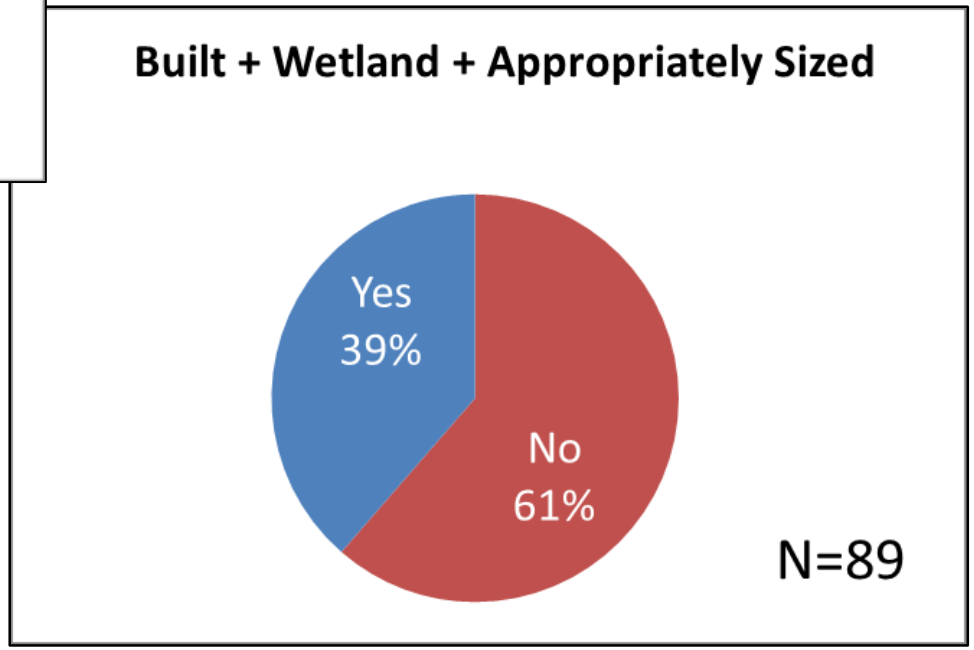




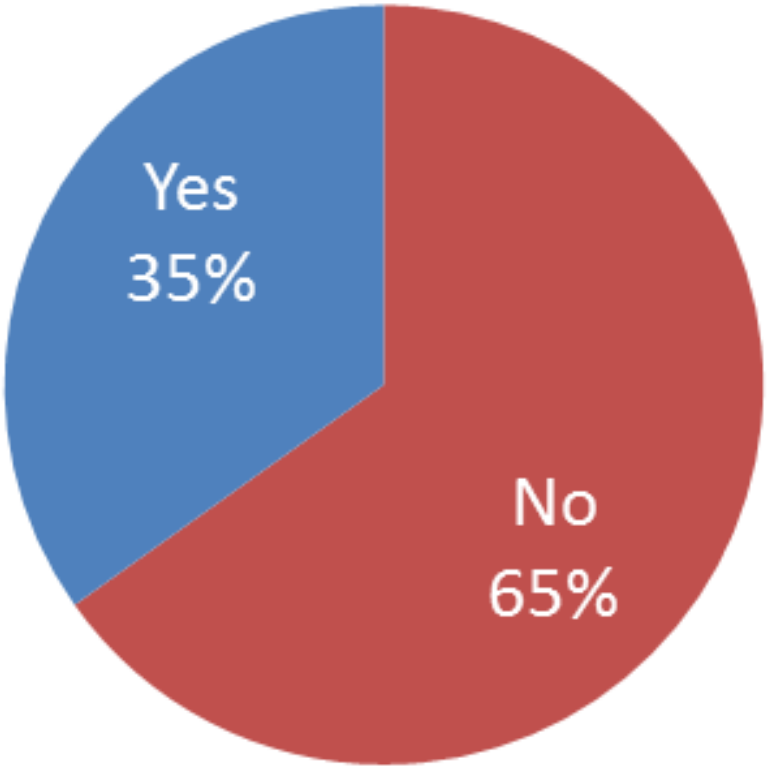


Size of Replacement Areas





Built + Regulatory Compliant



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First Step:
Update Mitigation Guidance Document

- Increased emphasis on Avoid, Minimize and Mitigate
- Document characteristics & functions of the Existing BVW
- Hydrology, HYDROLOGY, **HYDROLOGY!**
- Soils and vegetation
- Replicate wetland functions
- Wildlife Habitat
- Design: plans, cross-sections
- Construction
- Monitoring (environmental monitors strongly encouraged)
- Certificates of Compliance
- Combined replacement areas
- Alternatives to Wetland Replacement for Certain Projects
- Appendices: revised checklist


How To Assess Hydrology For
Design
And
Wetland Replacement Success
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Regulations

BVW

- Replacement area shall have same area as lost area (310 CMR 10.55(4)(b)1.)
- Groundwater and surface elevations of the replacement wetland must approximate lost wetland area (310 CMR 10.55(4)(b)2.)
- Similar bank length to lost area (310 CMR 10.55(4)(b)3.)
- Unrestricted hydraulic connection (310 CMR 10.55(4)(b)4.)
- Same general area and reach as lost area(310 CMR 10.55(4)(b)5.)

Limited Projects

- The Issuing authority shall consider…"the extent to which mitigation measures, including replication or restoration, are provided…" (310 CMR 10.53(3)
- Some Limited Projects may have more specific requirements (e.g. require compensatory flood storage, 310 CMR 10.53(3)(q))

Purpose of Hydrology Monitoring

- To design the Wetland Replacement
- To determine if the Wetland Replacement is successful
- What to determine by the monitoring:
  - **DEPTH** of inundation/saturation in relation to the ground.
  - **DURATION** that the water surface is above, at, or near the ground.
  - **FREQUENCY** of the inundation/saturation.
  - **WHEN** the inundation/saturation occurs (GROWING SEASON).

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Measurement Practices

- Inundation
  - Wetland and/or river/stream water surface
    - Staff gauges
- Saturation
  - Groundwater Elevation
    - Free Water Observation (in Hole(s) or Pit(s))
    - Groundwater Obs. Wells
    - Piezometers

Photo courtesy Bruce Bouck, MassDEP Drinking Water Program

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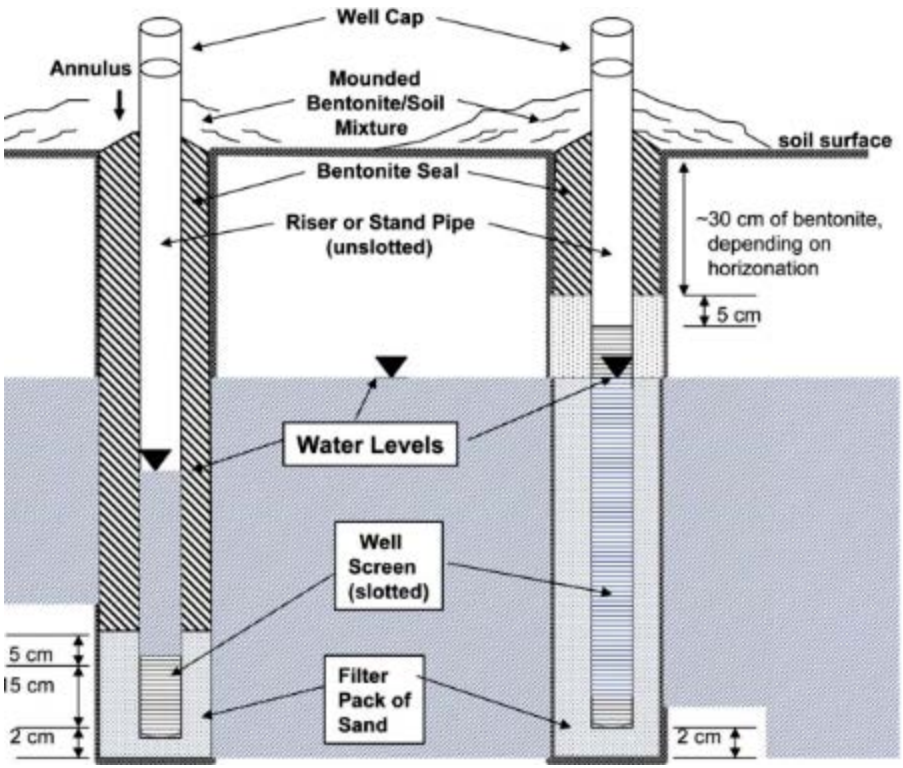
Obs. Wells vs Piezometers

- Observation wells monitor groundwater surface
- Piezometers measure pressure exerted by groundwater
  - May need to be nested.
- Observation wells should be used in most situations
- Perched water table: observation wells should not be installed through a restrictive layer.



Piezometer: Screened Only At Bottom

Well: Screened Throughout

Sprecher, S.W. 2008, NRCS

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Well Installation

- Borehole may be hand dug or machine augured (10 cm or 4-inch augur)
  - If well placed in a wetland, hand auguring should be conducted to minimize the impact to wetlands
- Sand pack in the annular space
- Bentonite or grout seal (piezometer need to be sealed both below and above screens)
- Well cap (loosely fitted)
- Driven wells or push point wells with no sand pack are intended only for temporary monitoring

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Recommendations

How many wells?	A minimum of 4-6 (groundwater surface needs to be triangulated)
How many piezometers?	A minimum of 9-18 (at least 3/nest)
How many staff gages?	At least one staff gage must be installed to measure water levels above the ground*
How deep should be wells be?	Design Phase: ~2-meters (6.6 feet) Wetland Replacement Phase: ~16-inches
How long to monitor?	Design Phase: As long as possible Post Wetland Replacement Phase: At least 2-years (310 CMR 10.55(4)(b)6.)
How often should the wells be read?	At least weekly, at same day/time
Manual reading vs automated data loggers	Either acceptable
Elevations	• Maximum • Average • Minimum

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*Measurements may also be made by measuring along well riser

Assessing Hydrology: Design Phase

- Investigate Site:
  - Assess wetland to be altered
  - Assess potential wetland replacement site(s)
- Collect Data
  - Water elevations
  - Corroborating hydrologic indicator elevations
  - Precipitation and Temperature
- Construct Water Budget for design
- Replacement wetland should be designed to be the same area size and same type as the wetland to be altered

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Data Collection: Design Phase

- Begin data collection as far in advance as possible
- Survey ground elevation in the wetland to be lost
- Measure water elevations observed in boreholes, shovel holes, pits, wells
- Measure elevations of hydrologic indicators, such as top elevation of redox in soil or top elevation of organic soil
- Obtain data: flood elevations, precipitation, temperature, index well levels, and nearby river gage discharge rate and stage.

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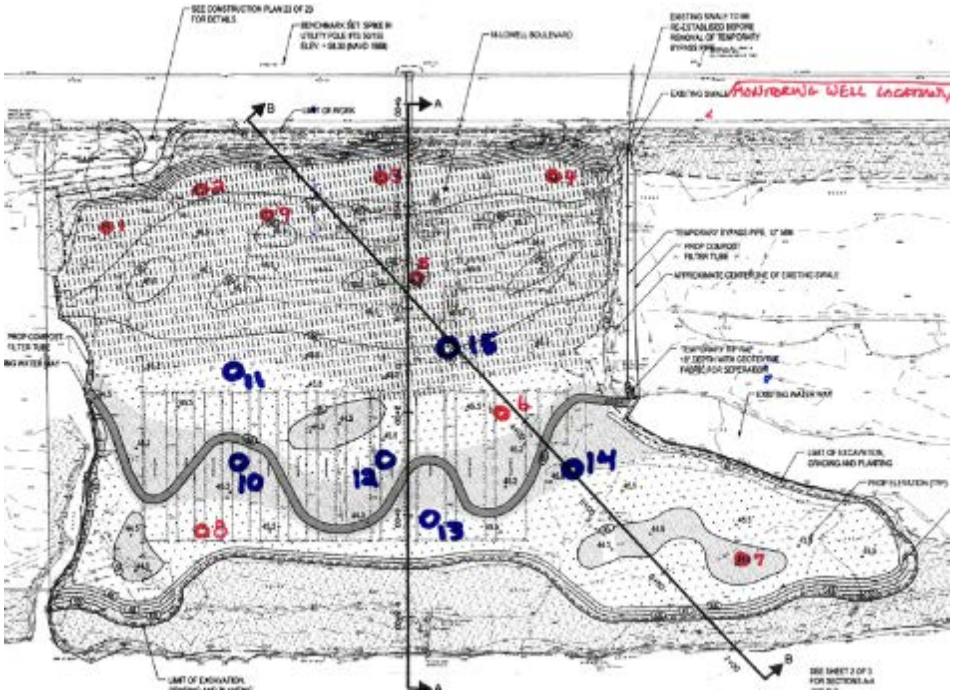
Data Collection: Post Wetland Replacement

More rigorous data collection!

Water elevations

- Inundation
  - Wetland and/or river/stream water surface
    - Staff gauges
- Saturation
  - Groundwater
    - Groundwater Obs. Wells
    - Piezometers



Plan Depicting Location of Proposed Monitoring Wells

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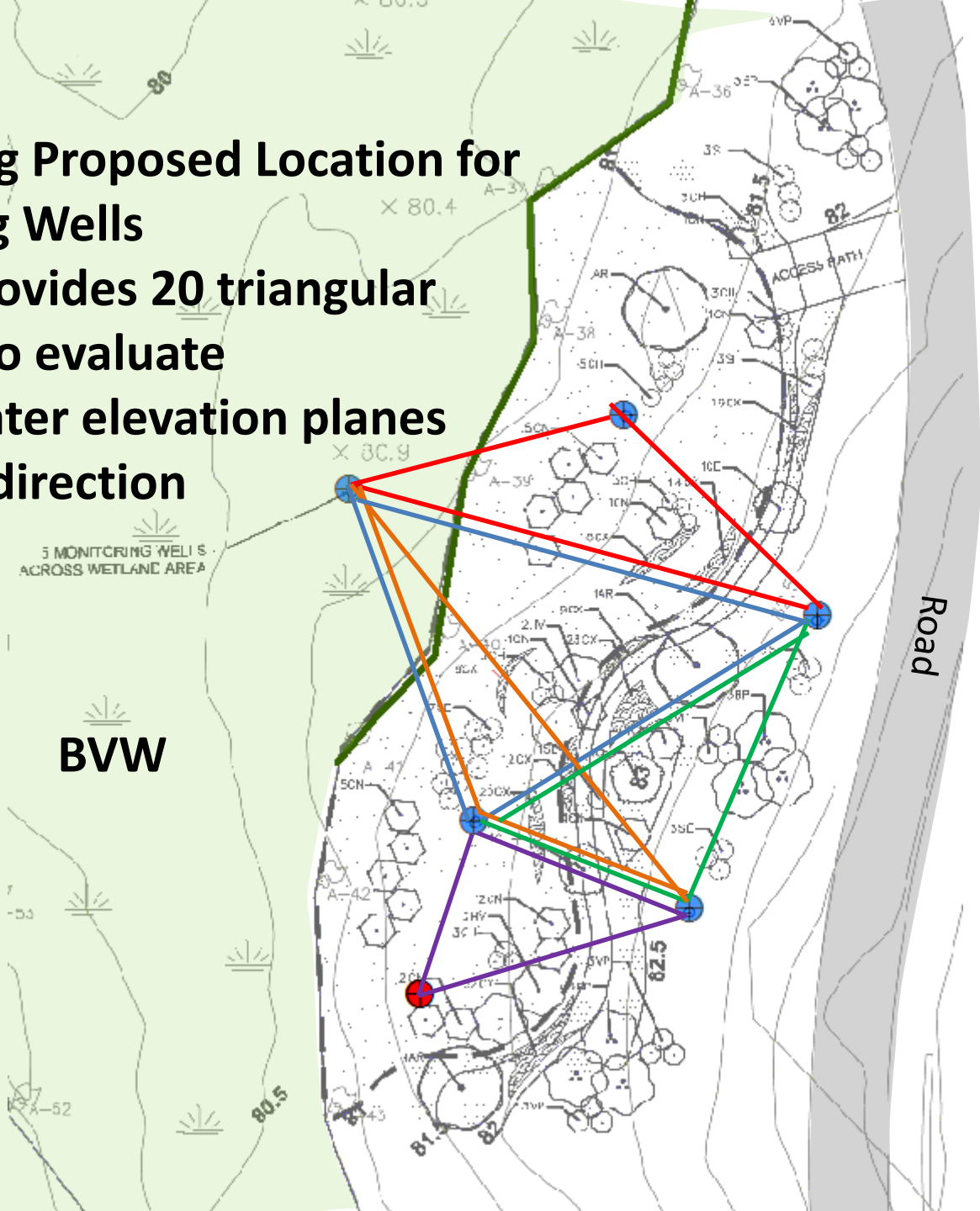
Plan Showing Proposed Location for 6 Monitoring Wells

- 6 wells provides 20 triangular surfaces to evaluate groundwater elevation planes and flow direction

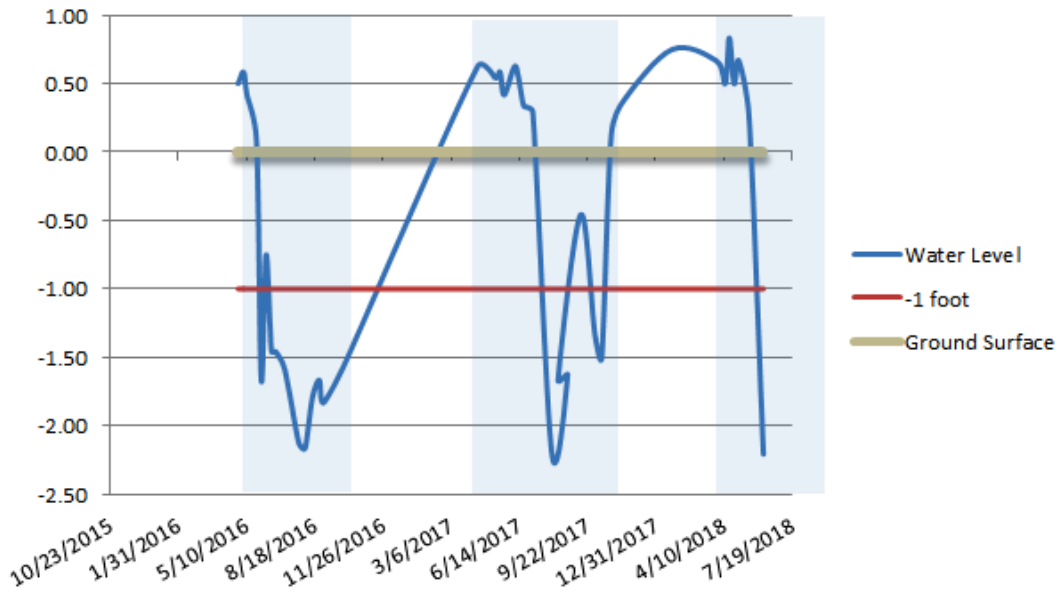


Assessing If Hydrology Is Successful In Wetland Replacement

Design Phase: Wet Meadow

No Water Budget Submitted

Post-Wetland Phase: Wet Meadow



- We can tell the post-wetland hydrology is at or near the surface during the growing season
- But, we need the design phase water budget in order to determine if the hydrology (including flood storage) approximates the lost wetland

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Alternatives to Wetland Replacement

There are two types of projects for which there is flexibility to use alternatives to wetland replacement for meeting BVW performance standards.

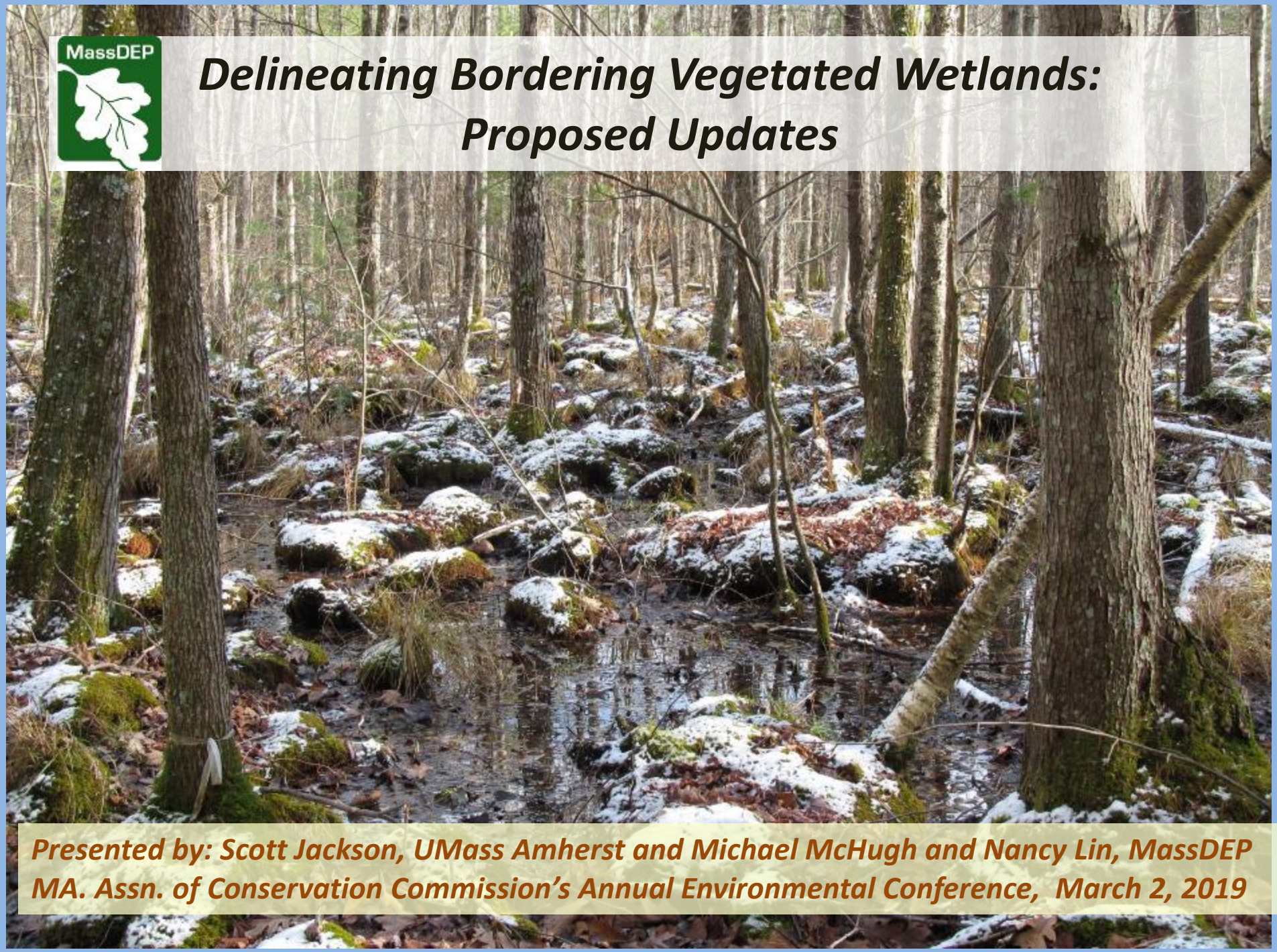
- "Limited Projects" per 310 CMR 10.24 and 10.53
- Variance projects per 310 CMR 10.05(10); variance projects are permitted by the Commissioner of MassDEP, not by Conservation Commissions

Alternatives to Wetland Replacement

- Reconnection of rivers or streams with their floodplains
- River/stream restoration
- Dam removal
- Culvert replacement
- Restoration of tidal hydrology
- Restoration of disturbed riparian areas
- Restoration of previously altered wetland
  - e.g. removal of permitted or grandfathered fill

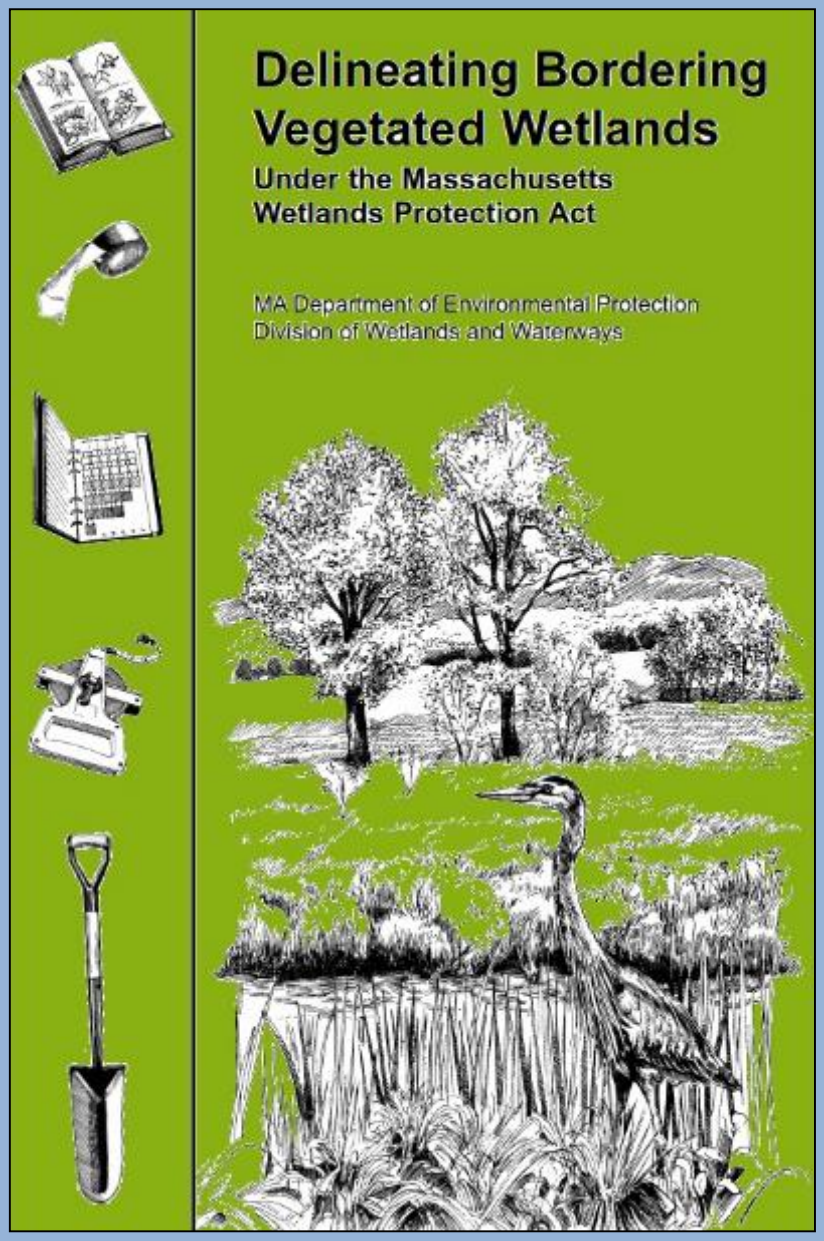
Next Steps

Delineating Bordering Vegetated Wetlands: Proposed Updates



Presented by: Scott Jackson, UMass Amherst and Michael McHugh and Nancy Lin, MassDEP

MA. Assn. of Conservation Commission's Annual Environmental Conference, March 2, 2019



Purpose of 1994-1995 Regulatory/Policy Revisions

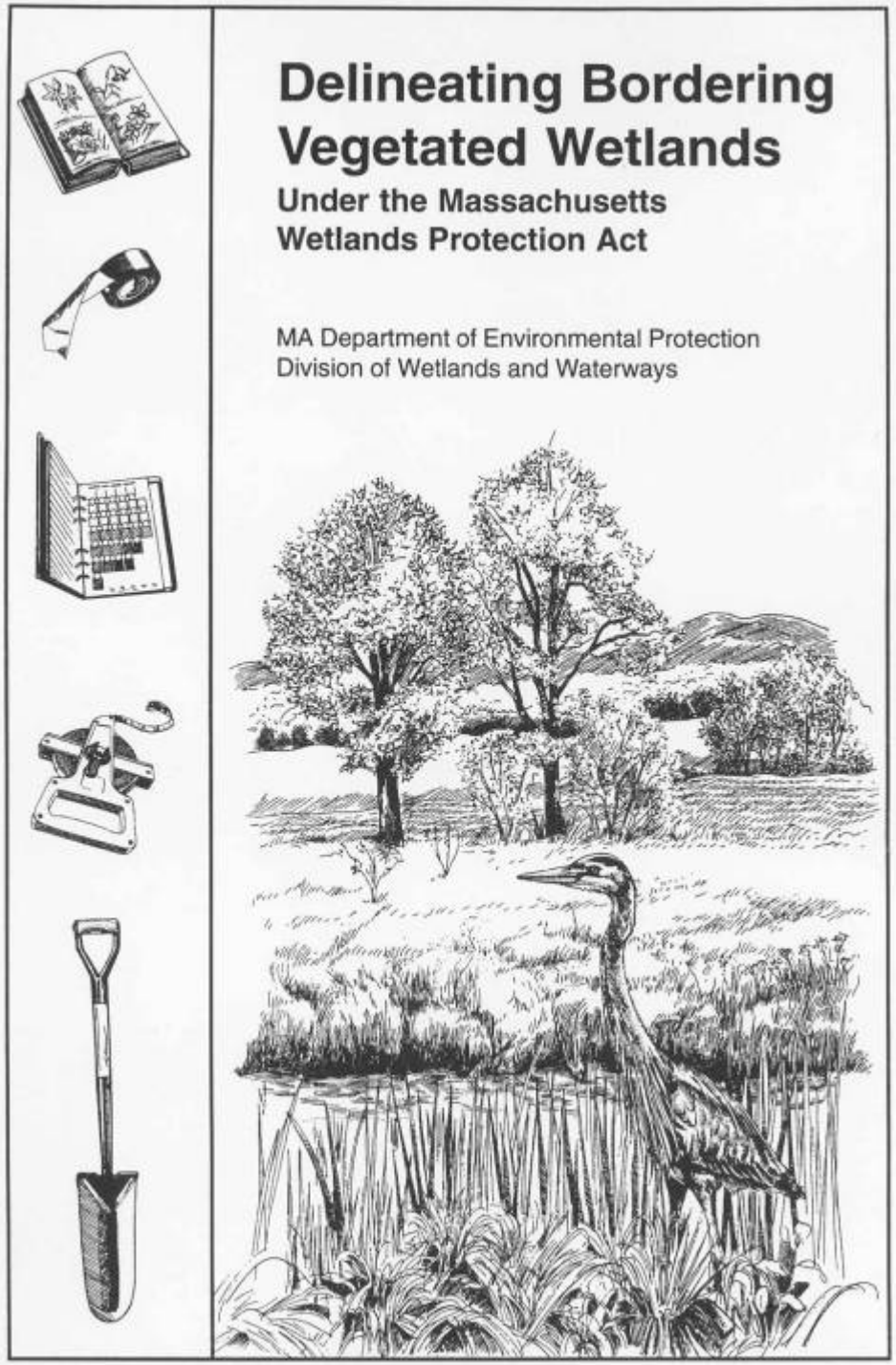
- Based on current wetland science
- Reduce wetland boundary disputes and appeals.
- More aligned with federal method.
- More protection.
- Rather than relying solely on vegetation, hydrology and soils allowed where it made sense.

1995 Manual

- 1988 Wetland Plant list
- MassDEP Hydric Soil Criteria
- Overview of Other Indicators of wetlands Hydrology
- Presents Technical Methods

Proposed Update

- 2016 Wetland Plant List
- Federal Hydric Soil Indicators
- Describes How to Assess other Indicators of Hydrology
- Presents Technical Methods



Delineation Manual Update

- Restrict when vegetation alone can be used to delineate a BVW
- Reference 2016 plant list
- More flexible 2-parameter approach
- Adopt federal hierarchy for vegetation analysis
- Adopt federal vegetative layers
- Deemphasize use of circular plots in favor of strip transects
- Soils treated as a separate chapter with much more technical detail
- Other indicators of hydrology presented in three groups
- Appendix on Soil Texture determinations
- Expand/revise list of Difficult Soils to Analyze
- New Delineation Form

Massachusetts Two Parameter Approach

Undisturbed sites with all dominant plants Obl or FacW and boundary that is clear and abrupt

- Wetland vegetation alone can be used

Undisturbed Sites with Soils that are not Difficult to Analyze

- Wetland vegetation and hydric soils
- Wetland vegetation and other indicators of hydrology
- Hydric soils and other indicators of hydrology

Disturbed Sites

- Evidence of altered hydrology: Use plants, soils and hydrology
- Evidence of altered vegetation: Use soils and hydrology
- Evidence of altered vegetation and soils: Use hydrology and/or historic data
- Wetlands with fill: Use soil (below the fill) and hydrology
- Recently drained sites: Use soils

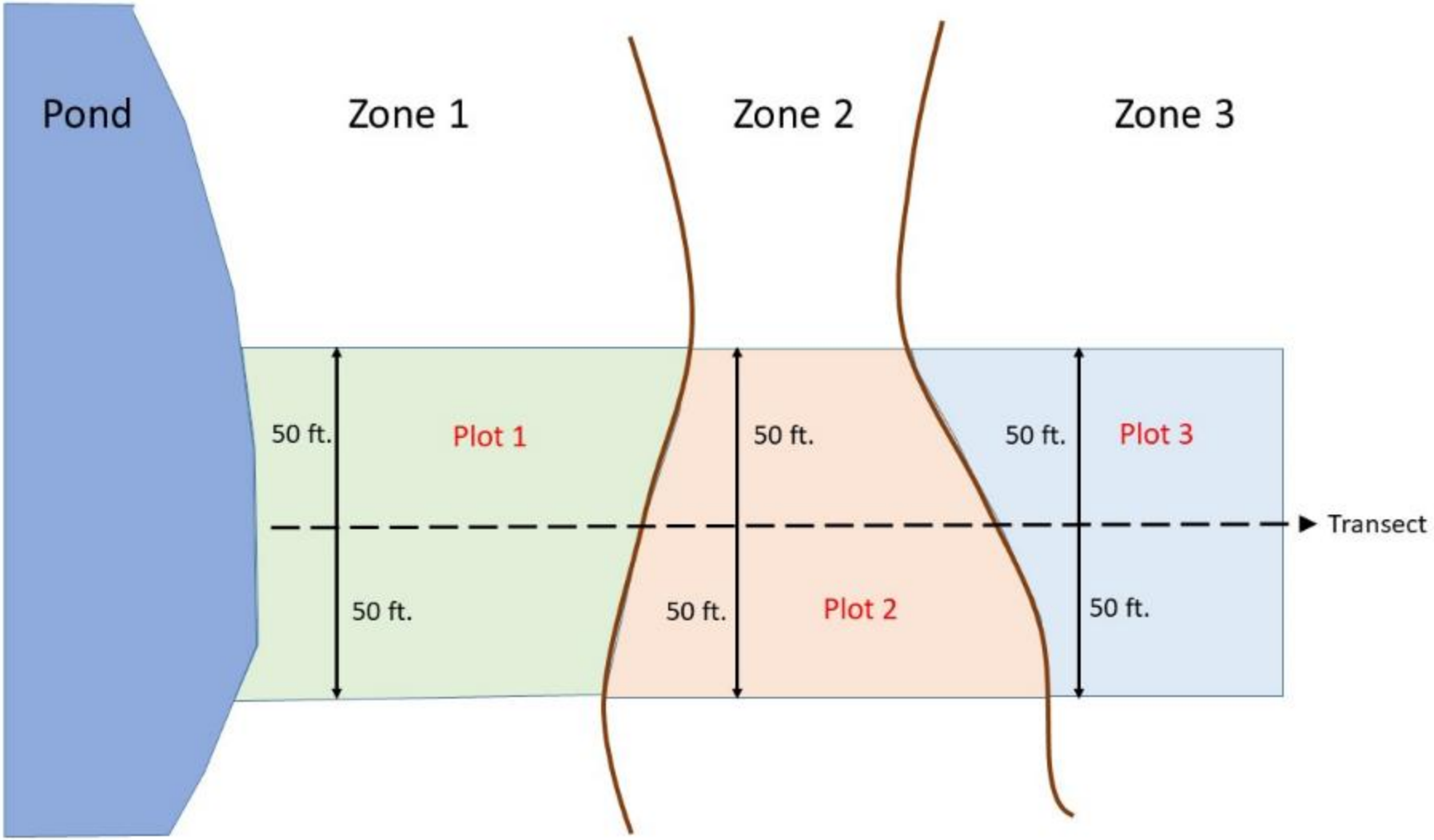
Hierarchy for Vegetation Analysis

- Rapid Test
- Dominance Test
- Prevalence Index
- Morphological Adaptations

Vegetative Layers

- Groundcover: herbaceous plants and woody plants < 3.3’ tall
- Shrubs & Saplings: woody plants ≥ 3.3’ tall but < 3” DBH
- Trees: woody plants ≥ 3” DBH
- Climbing woody vines

Strip Transect for Vegetation Analysis



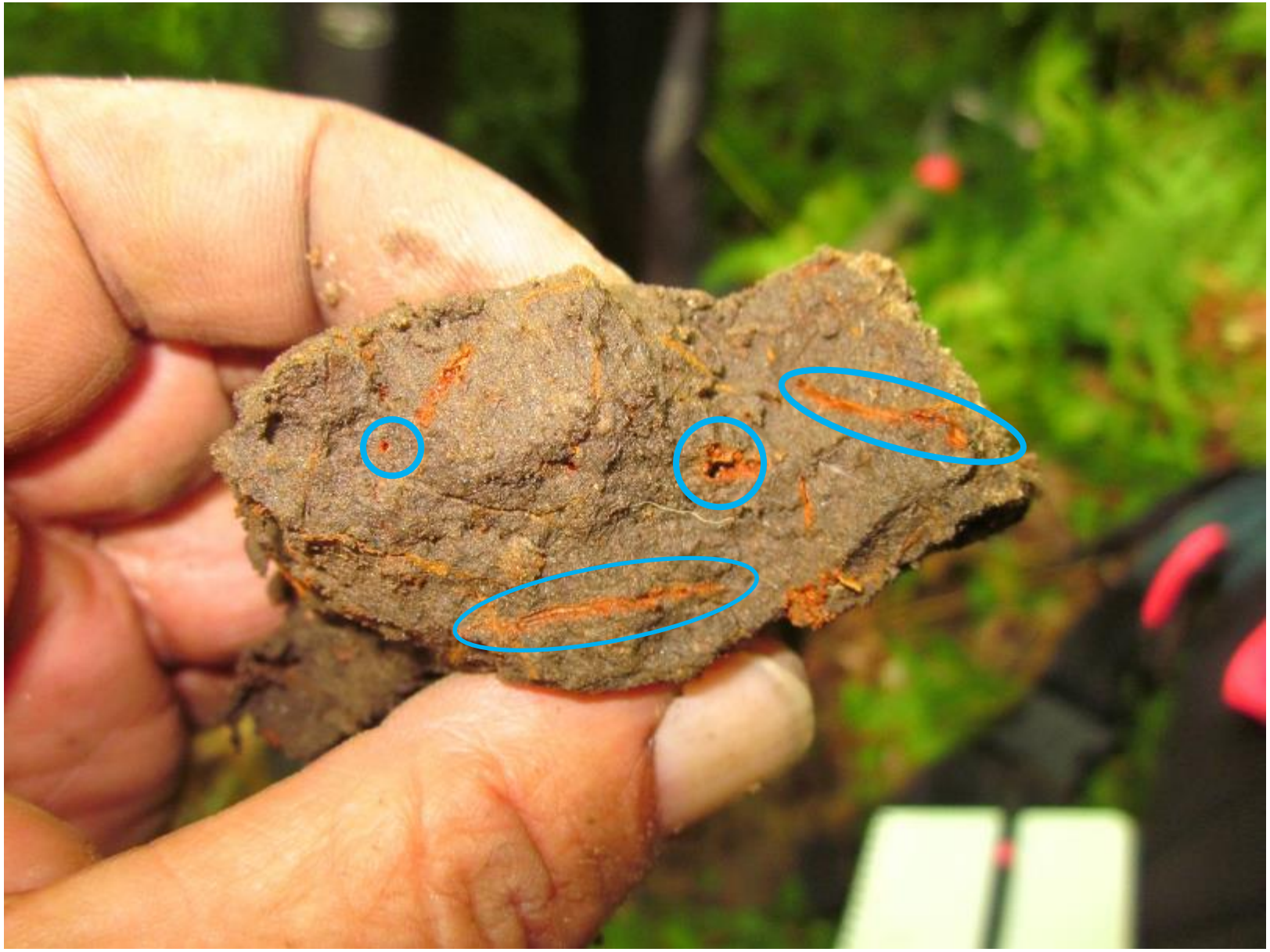
Other Indicators of Hydrology

- Reliable Indicators of Wetlands Hydrology
- Indicators that Can be Reliable for Establishing Wetlands Hydrology with Proper Interpretation
- Indicators of the Influence of Water

Other indicators of hydrology vary in their reliability and it is difficult to proscribe what combination of indicators are sufficient to establish that wetland hydrology exists at a site. Sound judgement must be used and all indicators available at a site considered, in order to accurately determine the BVW boundary. The goal must always be the accurate interpretation of available evidence to determine the limits of wetland hydrology.

Using Other Indicators of Wetland Hydrology: A Brief Overview

Oxidized Rhizospheres Along Living Roots



Observation of Standing Water-Inundation

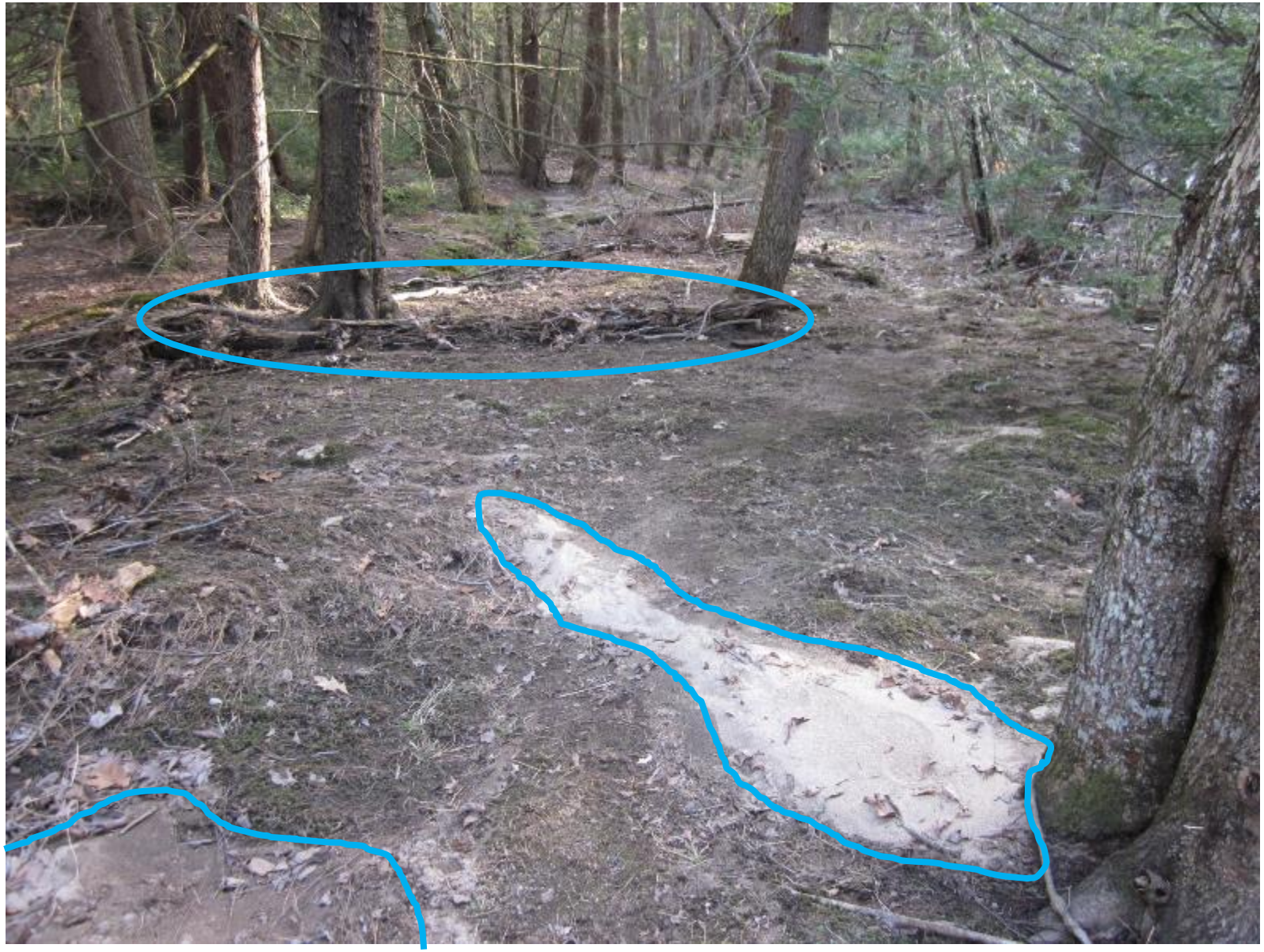
Free Water in Soil Hole

Water Stains-Water Marks

Propped Rooting

Swollen Base

Scouring, Sediment, and Drift Material



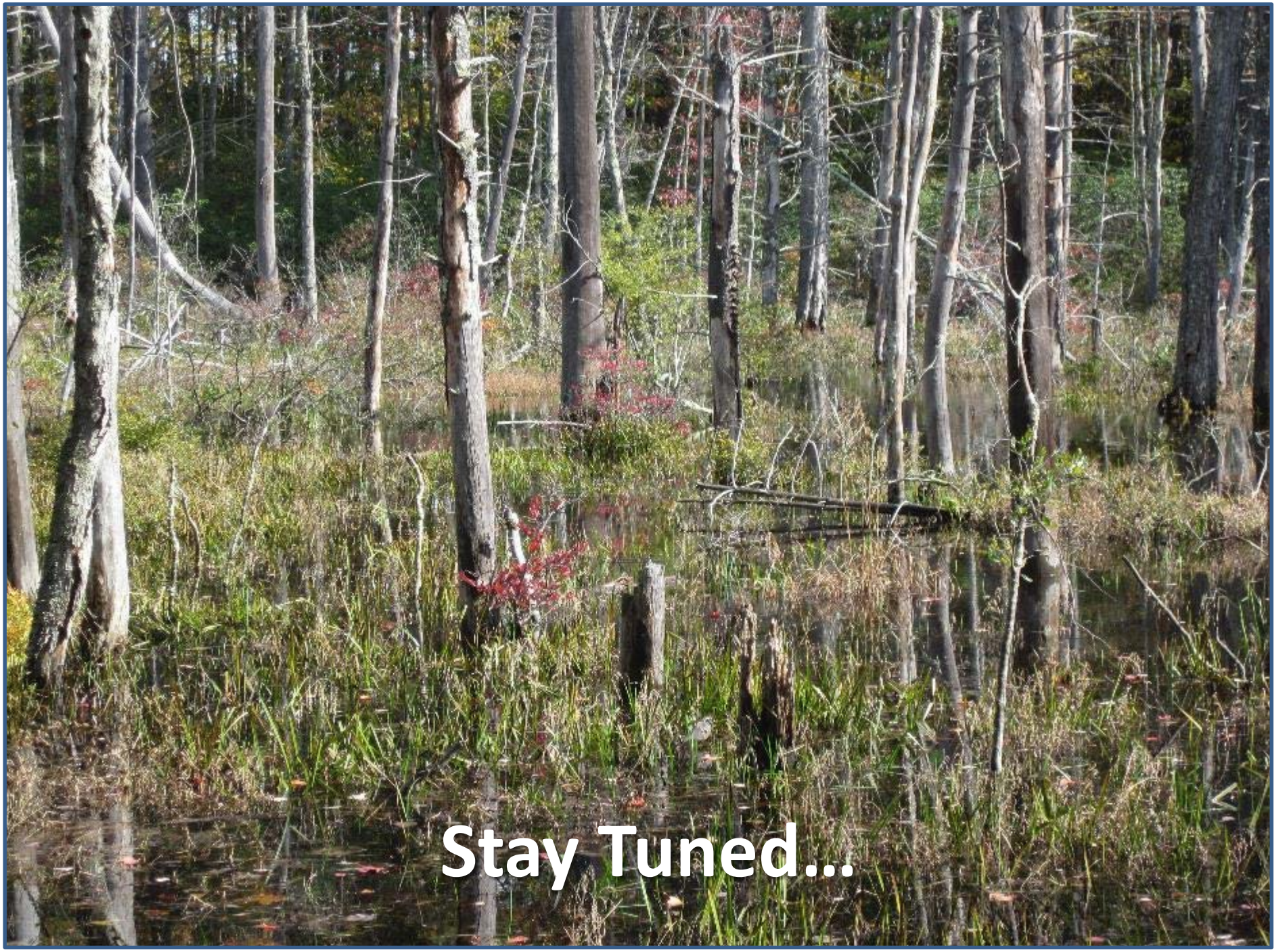
Hydrology is the driving force behind wetlands- Ralph Tiner

But the indicator must be considered in the context of where it occurs


Next Steps

Moving Forward

- Preliminary Concepts Presented at MACC AEC
- Final Version Requires, at a minimum, MassDEP Internal Review.
- Proposed Regulatory change limited to updating the Wetland Plant List.
- BVW Wetland Delineation Policy 95-1 will be updated.
- Training and Workshops will be coordinated with MACC.


Stay Tuned…