



# Gravel Wetland “Muck”

Creating a reliable specification to meet hydraulic conductivity, P content, and macrophyte needs

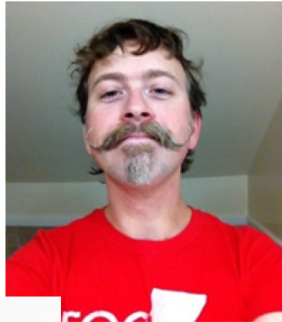
April 11, 2019

13<sup>th</sup> Annual Vermont Organics Recycling Summit

Vermont Technical College

Randolph Center, Vermont

# Introduction



- Jason Booth, PE: Vice-President of Aldrich + Elliott, PC, specializing in water resources design and construction management.



- Becky Tharp, PhD: Water Quality Program Manager at Watershed Consulting Associates, specializing in water quality monitoring of stormwater practices.



- Eric Roy, PhD: Assistant Professor, UVM Rubenstein School and Environment and Natural Resources. Expert in nutrient cycling in aquatic systems, particularly phosphorus.



# 2017 VT Stormwater Management Manual

- Section 2.2.4.1 – Water Quality Practices Selection
  - Tier 1 – Infiltration of WQv
  - Tier 2 – Meet water quality treatment standards when infiltration is infeasible
  - Tier 3 – Meet water quality treatment standards when Tier 1 and 2 are not possible

## **Tier 3 Practices<sup>3</sup>**

**Dry Swales (not designed for infiltration)**

**Filtering Systems (not designed for infiltration)**

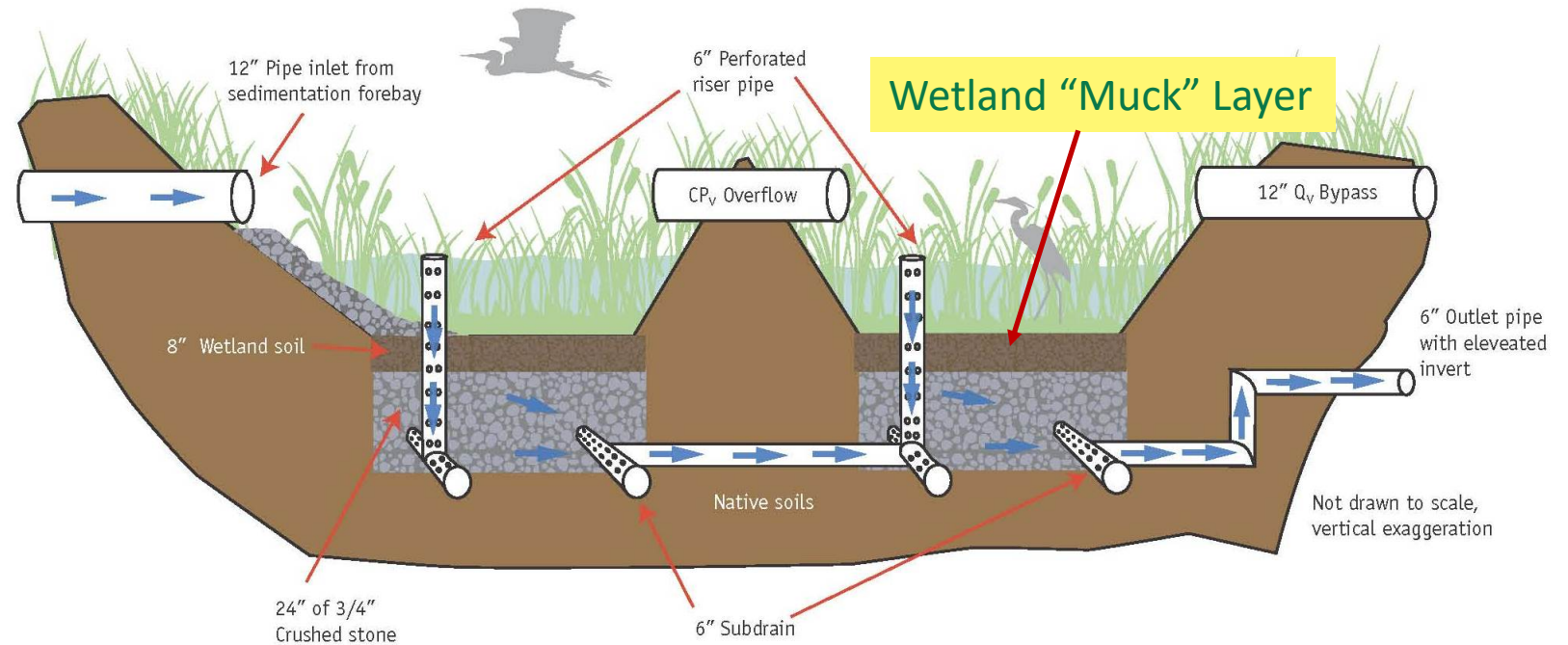
**Wet Ponds**

**Shallow Surface Wetlands**

*<sup>3</sup> These STPs generally meet 50-60% TP removal and achieve 80% TSS removal, and the  $T_v$  credit is equivalent to volume stored below the sump/underdrain, if applicable. (USEPA BMP Performance Curves, National Stormwater Database, International Stormwater Database)*

# Gravel Wetlands – an increasingly popular choice

- Common where there are poor soils and/ or high ground water;
- Typically consists of 24 to 36 inches of gravel capped with impervious soil layer (“muck”) to reduce short circuiting;
- Utilizes both aerobic and anaerobic zones.



(UNH Stormwater Center, 2009)

# The Problem

- Muck layer is critical for proper performance of the gravel wetland
- Where do we get this stuff?
  - Cannot remove soil from an established natural wetland;
  - Specifications being used by designers are variable;
  - Contractors building gravel wetlands cannot reliably source it;
  - Unreliable specifications for soil vendors to manufacture it – how much clay, organic matter, sand etc.? What are the goals of the material?



# Project Overview

## UVM Ecological Design Class

- Experimenting with wetland muck samples from local providers
- Prioritizing:
  - Low hydraulic conductivity (0.1-0.01 ft/day)
  - Low available phosphorus content
  - Capable of supporting plant growth
- Aim to result in specification for use by regulators, designers, and manufactures to optimize needs



Column study at UVM

# Project Schedule



# Thanks and Questions?

