



Demonstration of P-Trap

- P-removal curve is the heart
 - Importance of proper use of the P-removal curve regarding retention time and conc.
- Brief overview of functions
 - “Evaluate” vs “Design”
 - Library of PSM P removal design curves
 - Dissolved P and total P
 - Restriction orifice
 - Top-down vs. bottom-up flow



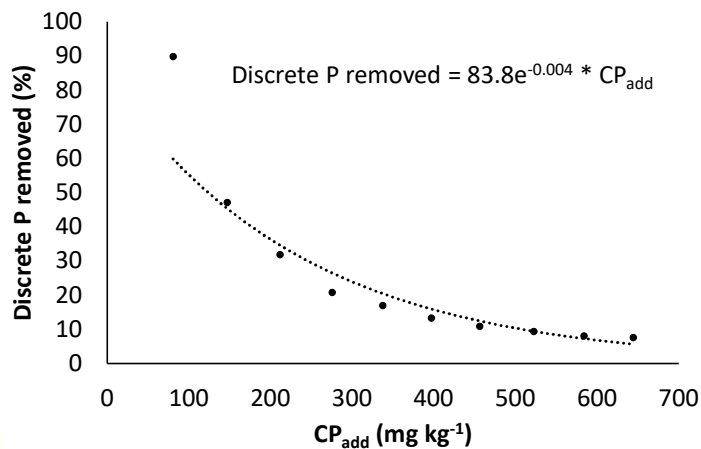
Demonstration of P-Trap

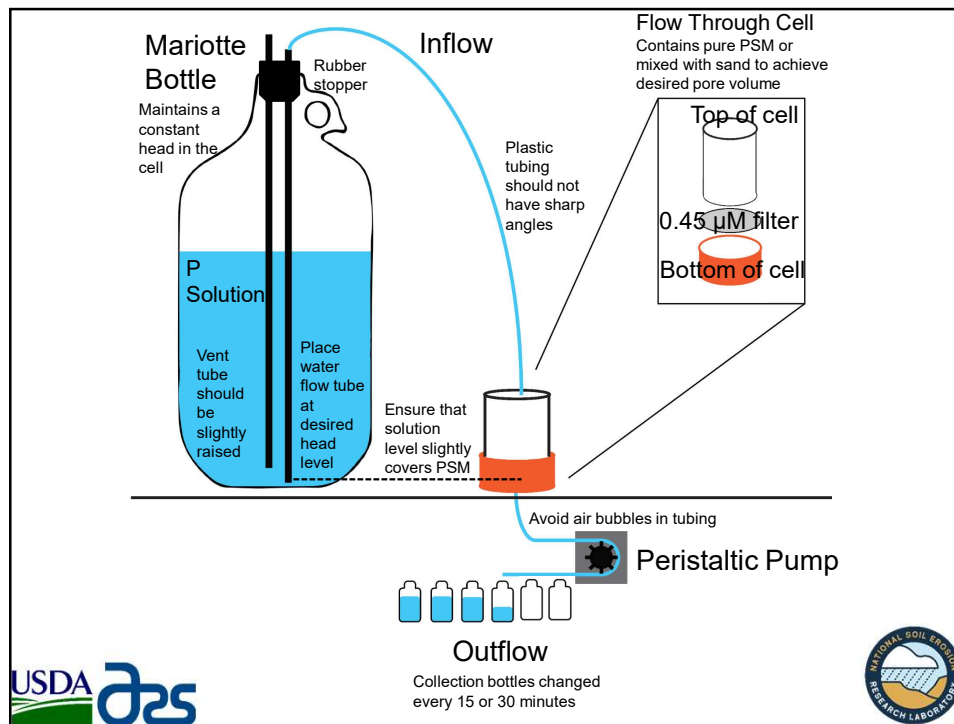
- Demonstration of the “Evaluate” function
- Demonstration of the “Design” function
 - Large surface bed for county drain in Clayton, MI
- Size matters: demonstration of evaluation of small modular structure



Example “Design Curve”

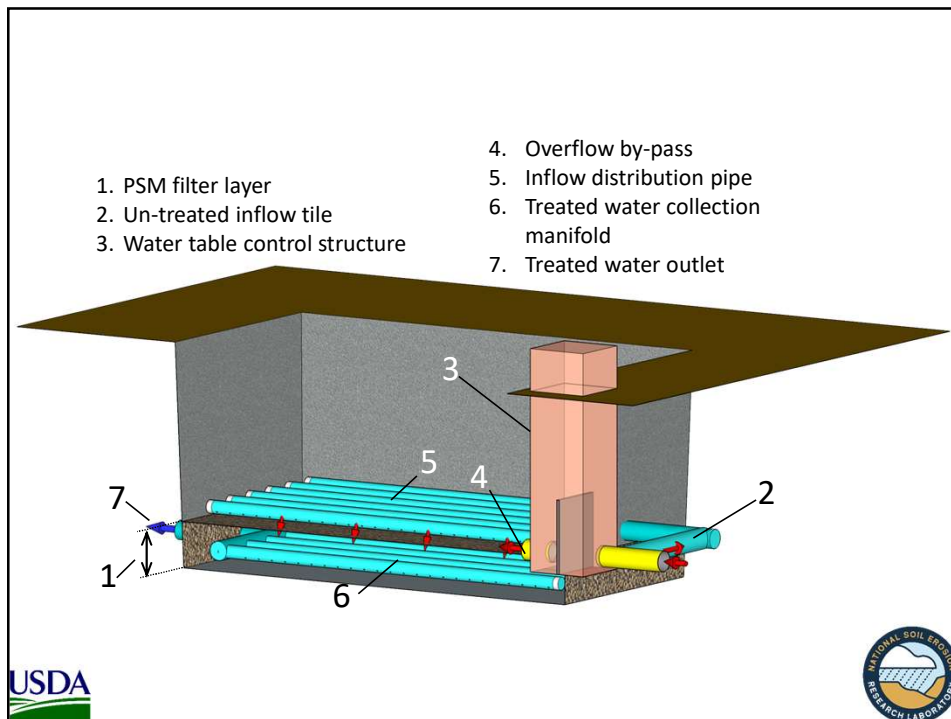
- Varies with inflow P concentration and retention time





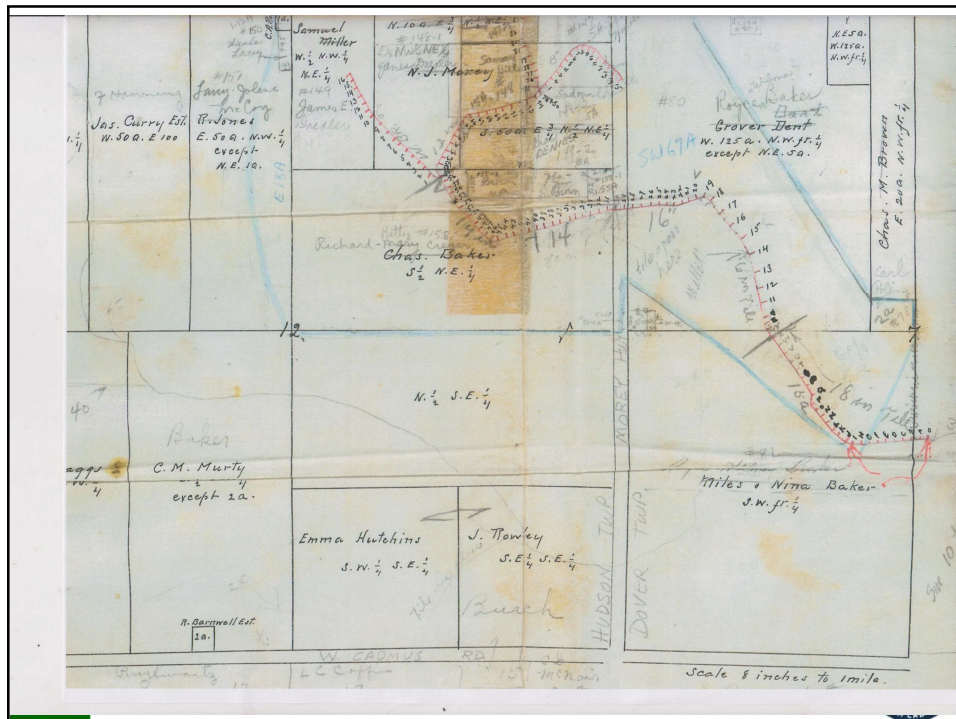
Example: 20 acre field in Northern IN – Size Matters

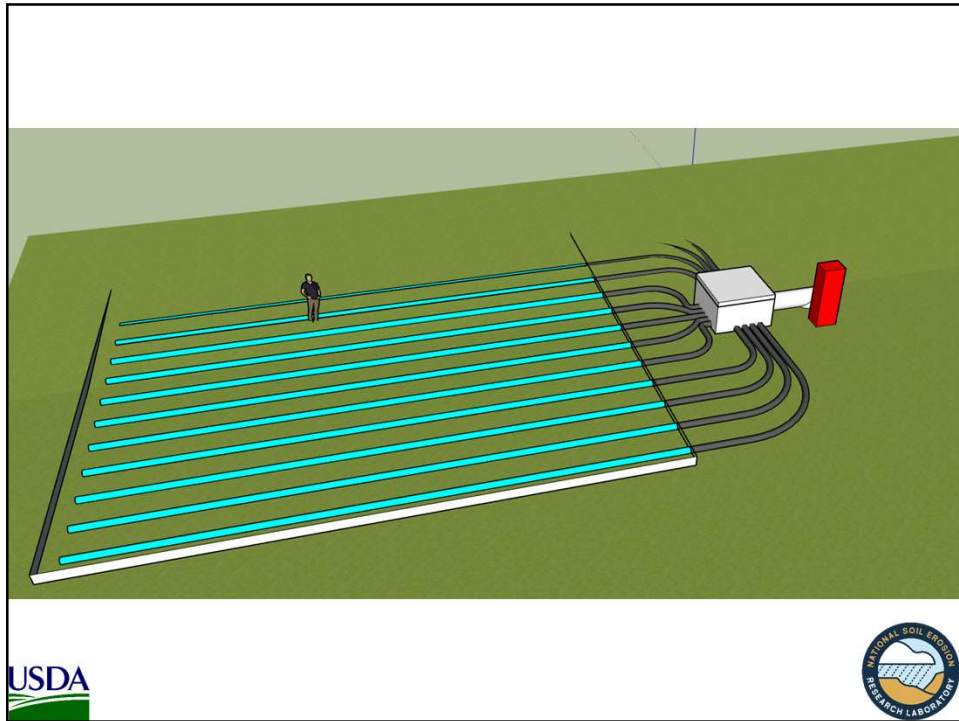
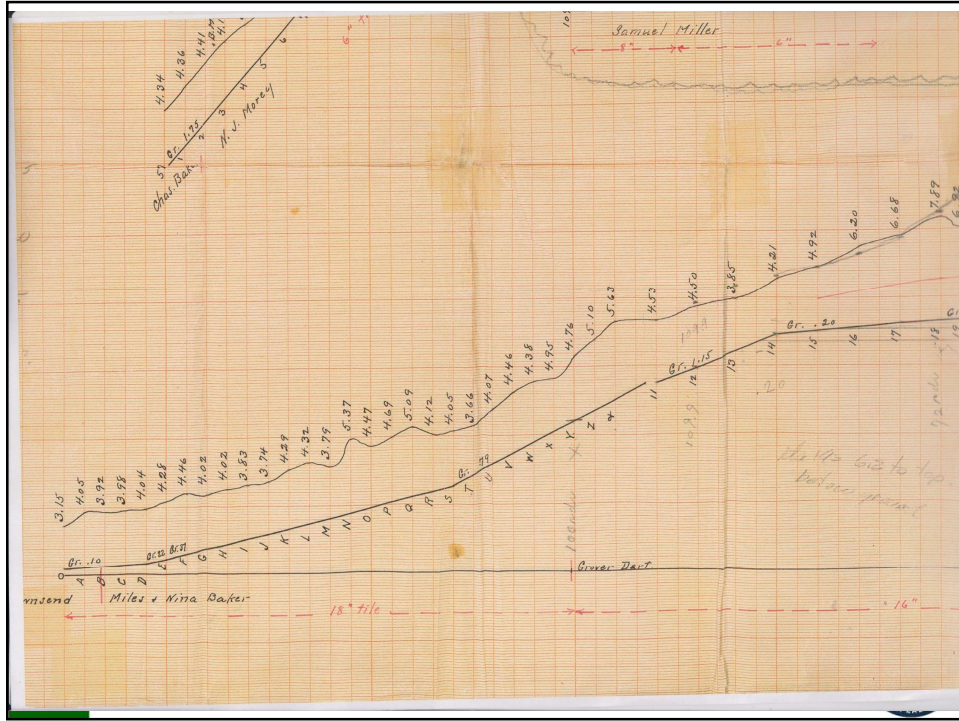
- 4 MGY, 0.2 mg/L
- 6" tile main
- Top-down flow: head = 16"
- EVALUATE function
 - Single vessel containing 15 five-gallon buckets of Fe-coated alumina ("Acti-Guard")
 - Tank containing activated Al

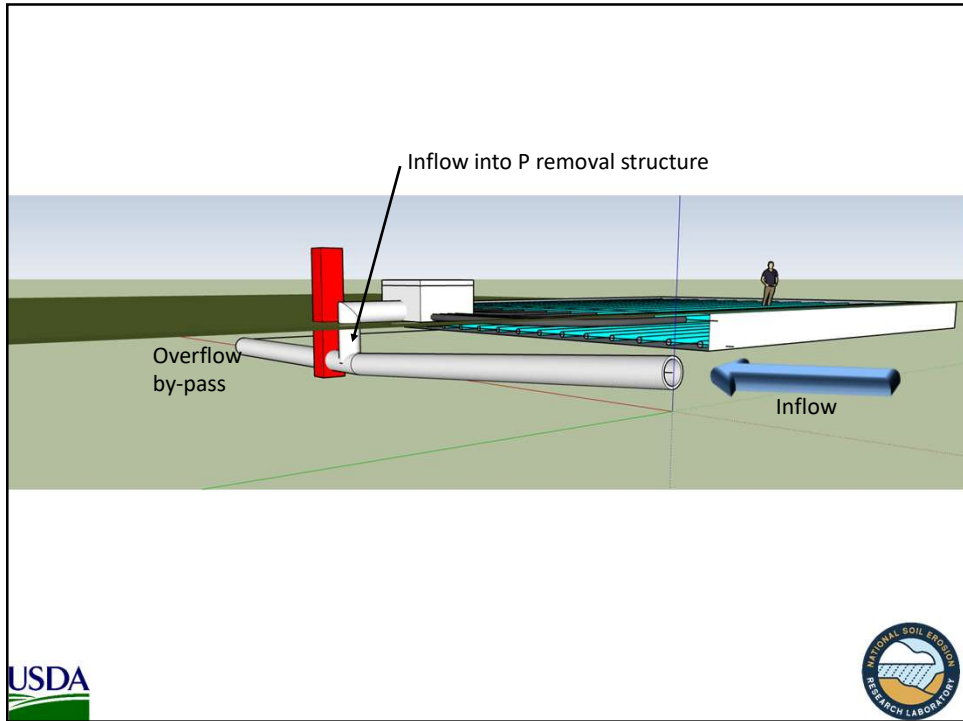
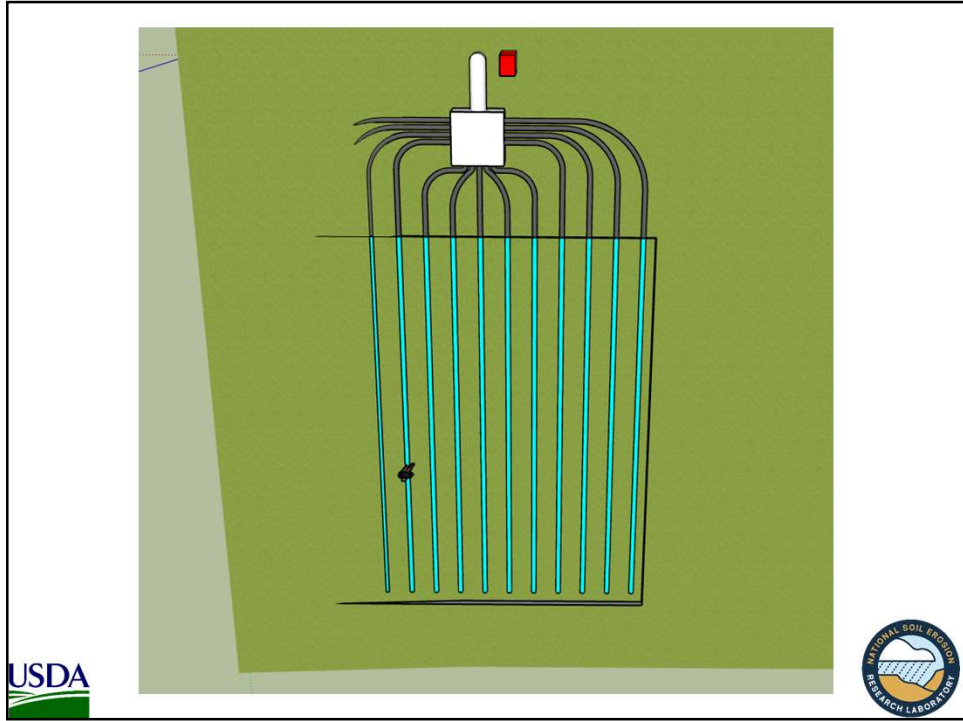


Example Design: 18" county main

- 142 MGY, 0.2 mg/L
- Surface bed at bottom of hill next to ditch outlet
 - Use WTCS to bring water to surface
- Metal-shavings gravel mixture
 - Top-down flow
 - 30" head based on depth to tile
- Goal:
 - 40% of 5 yr cumulative load
 - 800 gpm
 - 10 min RT







Subsurface tile drain filter design

- Site located in NW OH
 - 5.6 MGY
 - 0.2 mg P/L
 - Flow goal: Handle 200 gpm
 - P Removal goal of 35 – 40% of 10-yr load
 - 16 inches head
- Buried tank of activated Al vs buried bed of gravel-metal shavings (8%)



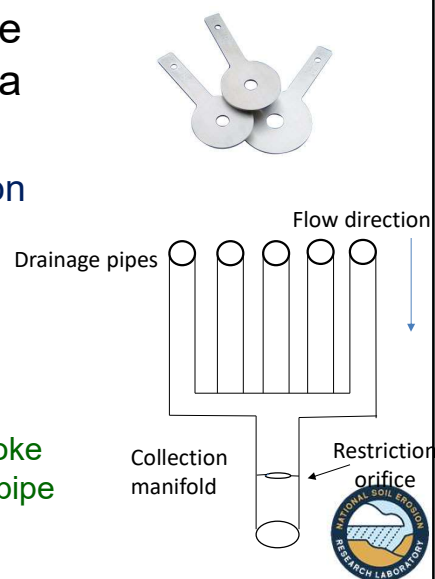
Example





Restriction orifice

- If the target peak flow rate is very low relative to area of PSM bed:
 - Consider using a restriction orifice in the drainage manifold pipe
 - Use as many pipes as necessary to achieve good distribution
 - Use restriction orifice to choke flow rate of final discharge pipe

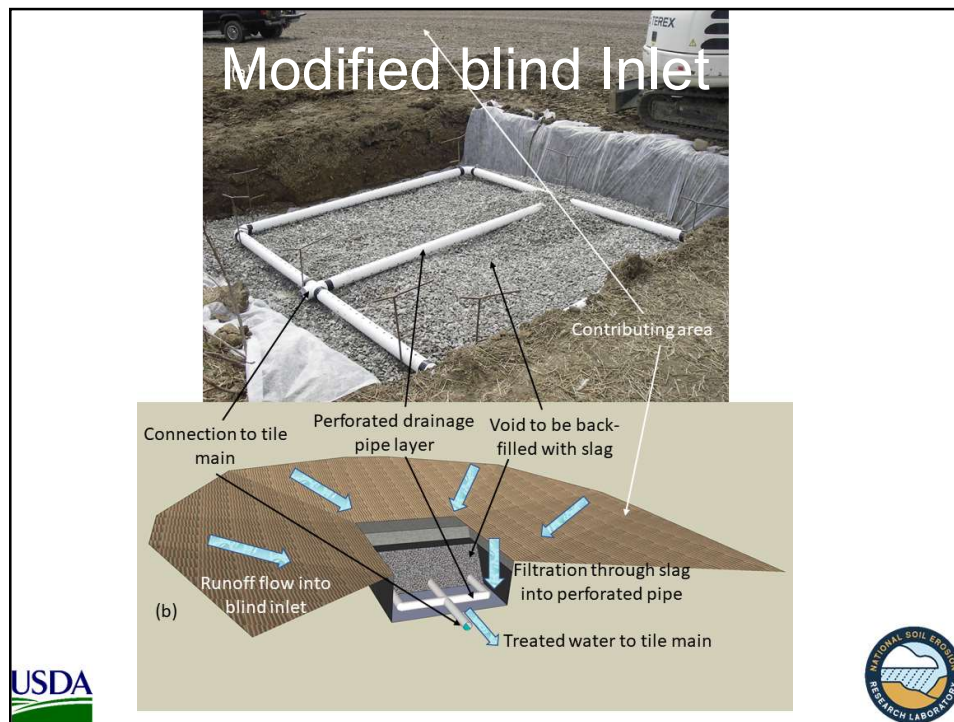


Restriction Orifice

- Need them when:
 - Target RT is high, small bed area, media has high Ksat, and few pipes are required relative to PSM bed area
 - i.e. need good pipe distribution to collect treated water but flow rate needs to be kept low to maintain RT
 - Orifice allows you to use unlimited pipe for collecting water without reducing RT below target design value

- Example in P-Trap
 - Top-down bed requires minimum RT of 10





Modified blind inlet

- IA: prairie pothole (walnut)
 - Surface water, not tile drainage
- EVALUATE: use traditional size
 - 15 x 15 ft, 30 inches thick
- 2 MGY, 0.4 mg/L
- Slag, then metal shavings

Traditional Blind Inlet

