



Stantec

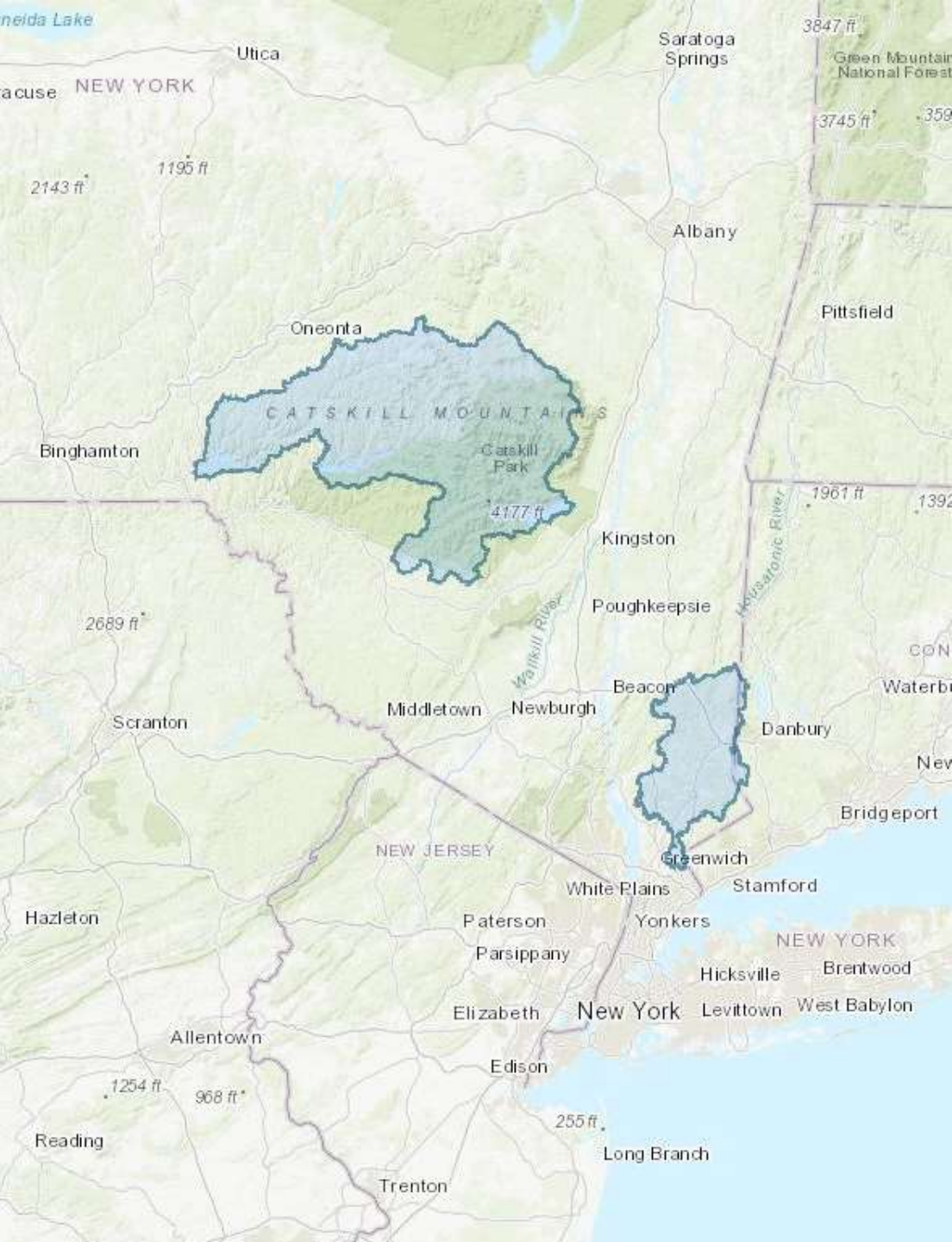
## National Stream Restoration Conference 2023

Use of Multi-Functional In-  
Channel Structures in Catskill  
Mountain Streams



# Agenda

1. Program Overview
2. Stream Characteristics
3. In-Channel Structures



## NYC DEP SMP

WOH Watersheds:

- 1,584 square miles
- 3,700 miles of streams

Long-term watershed protection

- Reduce sediment
- Flood hazard mitigation
- Aquatic habitat improvement



# Stream Characteristics

- B and C-type channels
- High energy
- Cobble/boulder bed material

## Uses

- Recreation – Tubing/Kayaking
- Angling

# Fish Species

- Brook Trout (native)
- Brown Trout
- Rainbow Trout



# Threats to Fish Habitat

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- Turbidity
- Woody debris removal
- Recreational activities
- Historic habitat destruction and over-fishing



# Designing In-Channel Structures

FISH HABITAT

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graph TD; A[FISH HABITAT] --> B[BED AND BANK STABILIZATION]; B --> C[NATURAL APPEARANCE];
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BED AND BANK  
STABILIZATION

NATURAL APPEARANCE

BOULDER CLUSTER (TYP.)



EXISTING SEDIMENT DEPOSITION WITH ADVANCING HEADCUT

EXISTING SCOUR AT TOE OF SLOPE

WATERWAY TO BE REDESIGNED BY 6/1/2017

BEGIN ALIGNMENT ADJUSTMENT APPROXIMATELY AT BOTTOM OF EXISTING RIFPLE

CONSTRUCTED RIFPLE WITH BOULDER VANES (TYP.)



WOOD TOE BENCH NTS

RIGHT BANK TIED IN AT EXISTING BOULDER REVETMENT



SOFTEN EXISTING BEND AND SHIFT CHANNEL AWAY FROM MASS WASTING BANK TO ACCOMMODATE BENCH INSTALLATION, BANK TREATMENT, PLANTING, AND STABILIZATION TECHNIQUES TO BE REVIEWED AND REFINED UNDER DESIGN DEVELOPMENT.

EXTEND GRADING THROUGH DEPOSITIONAL BAR TO ARREST HEADCUTTING AND CENTRALIZE FLOW

WOOD TOE BENCH NTS

6+92.3

6+23.2

4+84.9

3+80.6

2+76.3

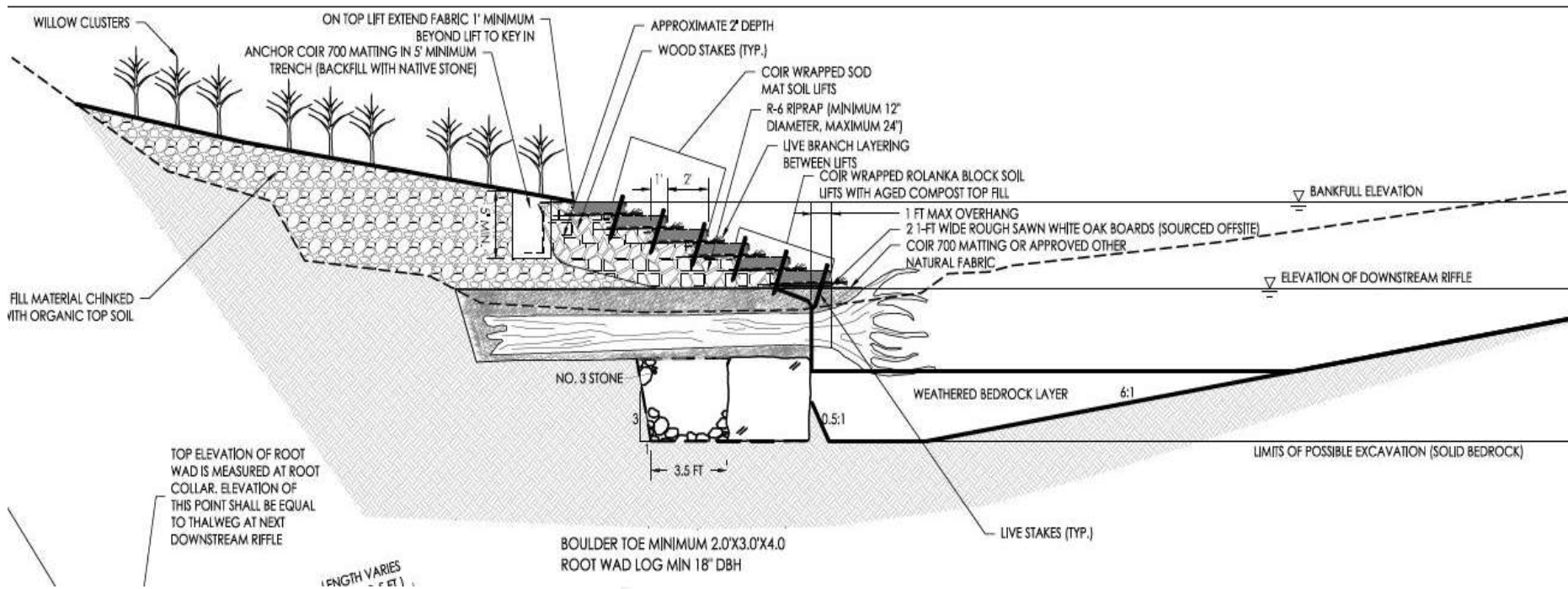
2+02.9

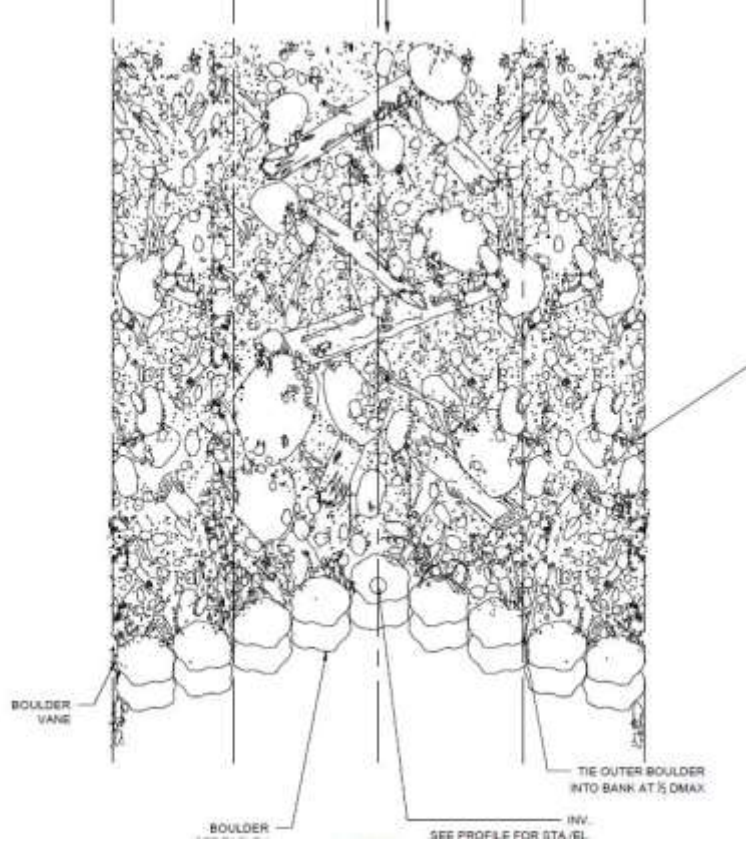
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# Wood Toe with Undercut Bank

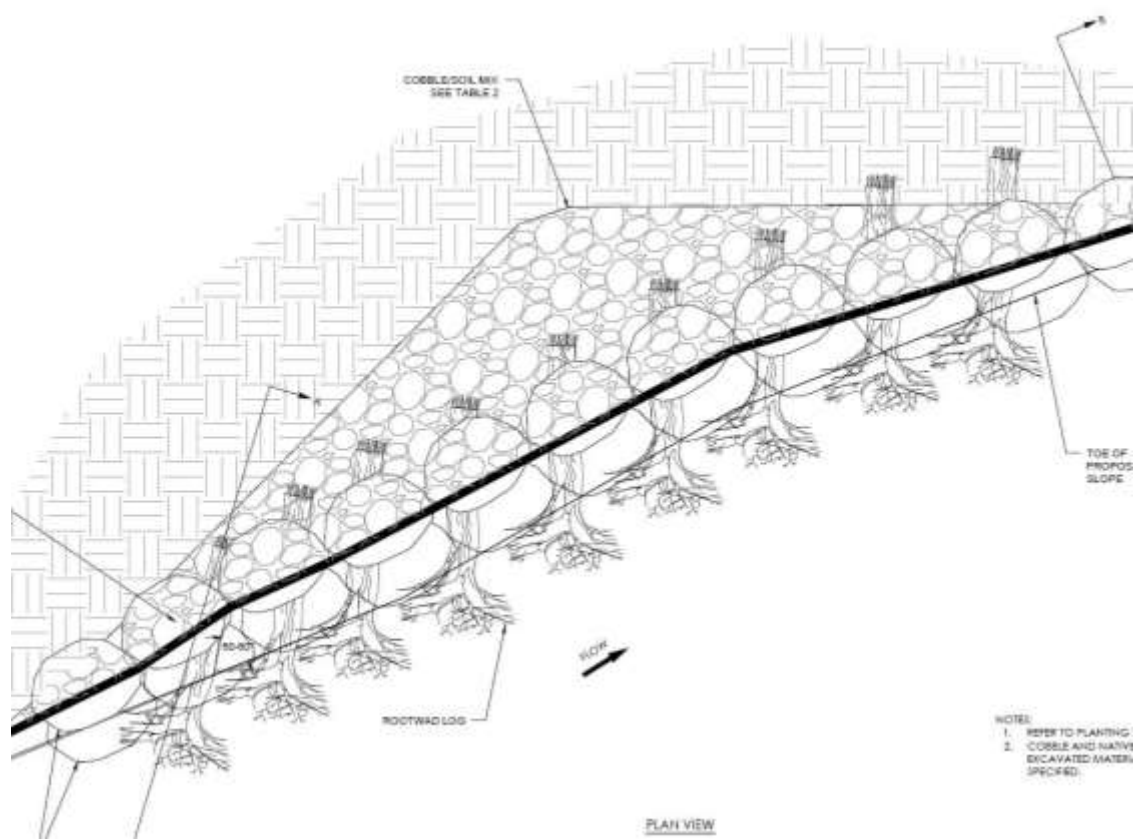
- Bank Protection
- Fish Habitat
- Recreation





## Roughened Channel with Boulder Sills

- Varied flow dynamics
- Oxygenation
- Micro-pool Habitat
- Bed Stabilization
- Native material



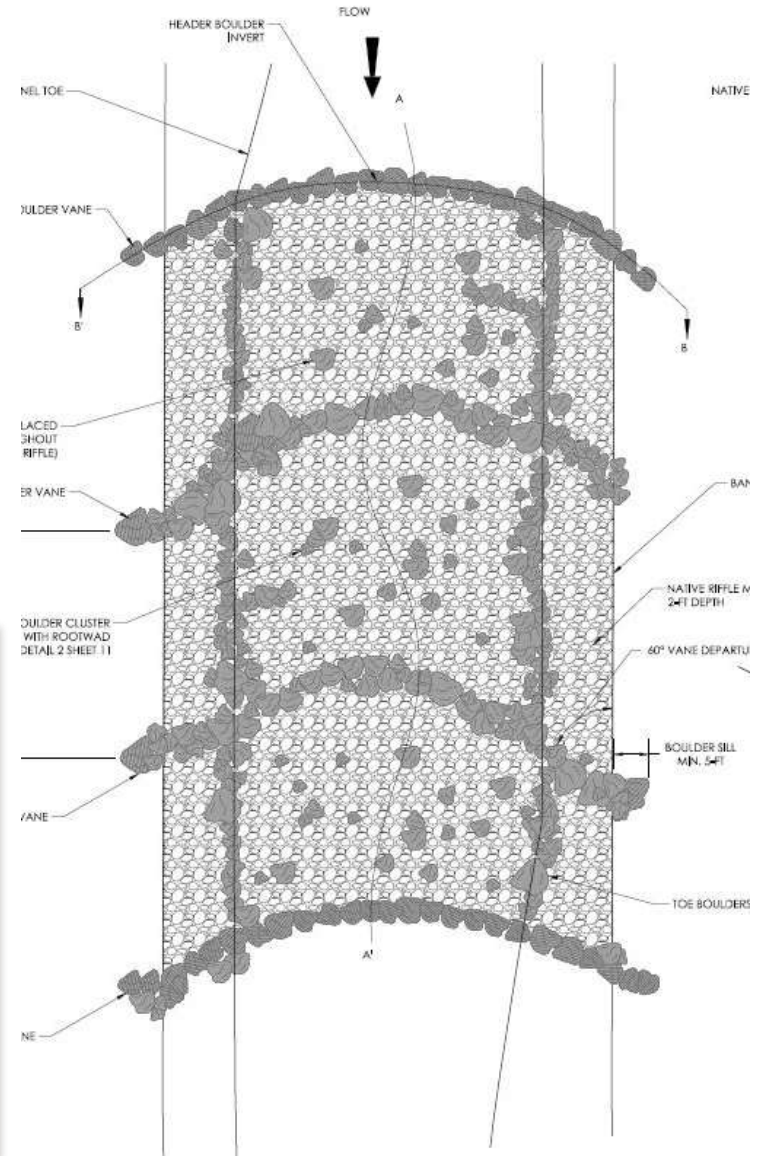
# Rootwad Bank Protection

- Bank stabilization
- Oxygenation
- Habitat cover
- Natural materials



## Boulder Riffle/Run

- Varied flow dynamics
- Oxygenation
- Micro-pool habitat
- Resting areas
- Bed/bank stabilization





# Boulder Clusters with Rootwads

- Micro-pools
- Resting areas



# Planting

- Live Staking
- Soil Lifts with Live Branch Layering
- Upland planting



# Questions?

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