Resilient Stream Restoration Design

Chesapeake Bay Program – Joint Meeting

Discussion with
Urban Stormwater and Climate Resiliency Workgroups

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Valley Characteristics From 8,000 yrs. BP to Pre-European Settlement

- Thin layer of angular to subangular basal gravels over bedrock.

- Valley formed from hydrologic conditions much worse than present warm period.

- Thin layer of fine sediments with high percentage of organic material. Floodplain soils formed by deposition of fine sediments and organic material

- Pollen/sediment analysis indicates that the valley bottoms were typically swamp or marshlands with little bedload movement.

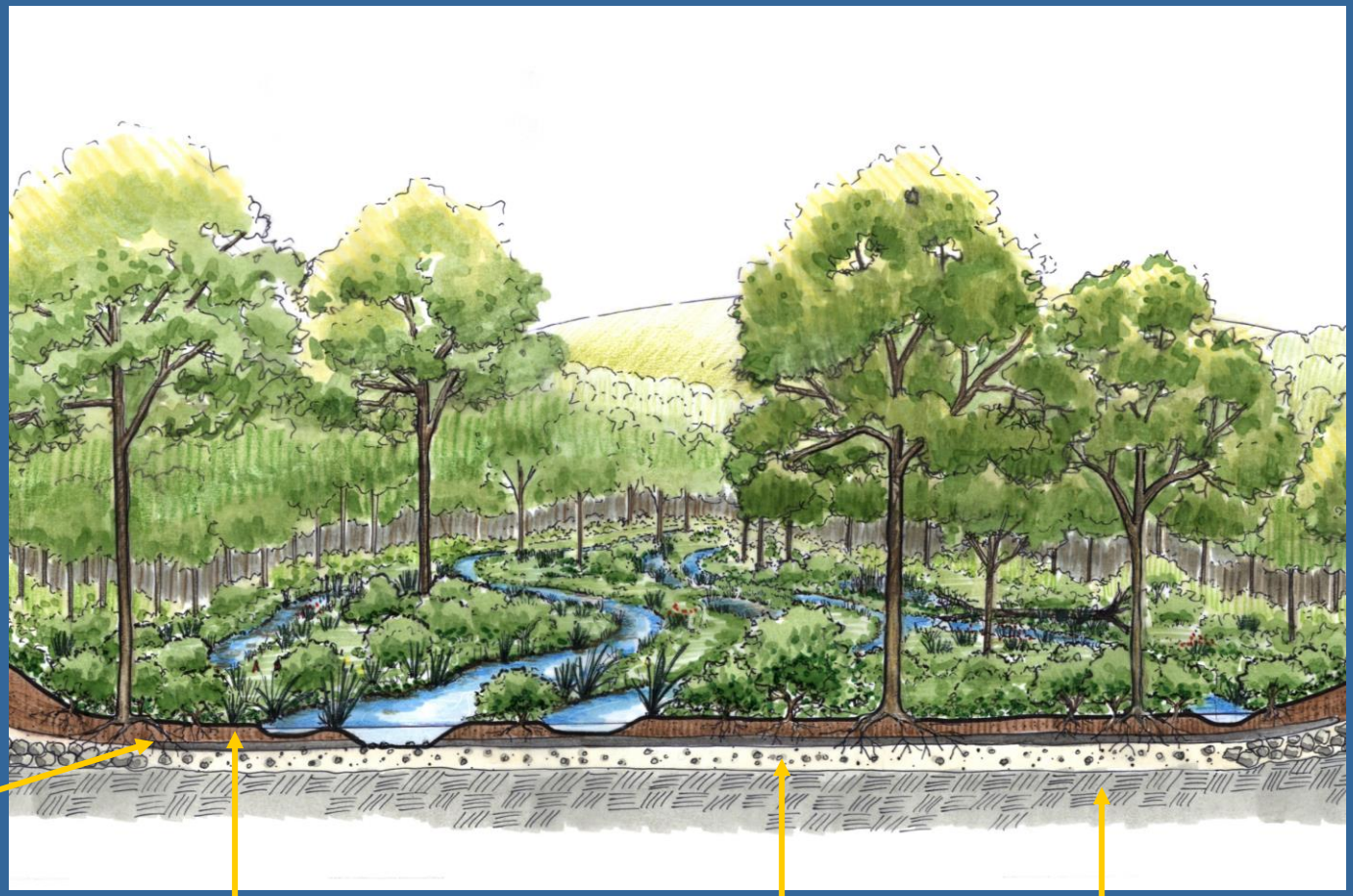
- Very little evidence of deep channels.

Valley/Floodplain Restoration
Improving Environmental Conditions

- Reduce bank erosion and downstream sedimentation and nutrient loadings.
- Frequently reduces thermal impacts due to increased groundwater connection to surface.
- Increase nitrogen removal by re-connecting root zone to groundwater level.
- Improve groundwater recharge opportunities.
- Reduce local flood elevations locally.
- Increase aquatic habitat functions and diversity.
- Create vegetated riparian buffers attached to groundwater and stream.
- Remove/Reduce invasive species (frequent inundation).
- Recycle post-settlement alluvium into cropland or other areas.

Historical Floodplain

Connectivity between Rooting Zone, Groundwater, and Stream Flow



Roots extend to groundwater

Floodplain Soils – Shallow, Peaty, Organic, & Porous

Cobble/Gravel Bed (Groundwater)

Bedrock

Shober's Run at Bedford Springs Resort

D.A. = 14 sq. mi.
Design Discharge = 30 cfs
Top of Bank Boundary Stress = 0.2 psf

First year after restoration

Floodplain or Valley Restoration
Primary Design Criteria/Objectives

- Create conditions that retain sediment, nutrients, carbon and aquatic organisms which requires low-stress conditions for even high flow events.

- Floodplain width necessary to maintain boundary stress ≤ 2.5 psf if practical for 100 year flow. Typically the required width is significantly less than the natural valley width.

- Channel width/depth based upon base flow and groundwater conditions not a storm event.

- Vegetation with rooting depth extending to groundwater/gravels provides protection of floodplain and bank soils for all flood events

Issues for Floodplain/Valley Restoration Related to Increases in Flood Flows

- Natural Valleys are typically wide enough to handle a 15 to 20% increase in flows

- Development or Encroachments may reduce the width of the natural valley possibly (1) increasing the frequency and size of vertical controls or (2) reducing the potential or number of sites that floodplain restoration is feasible.

- There will be no effect of the channel size or ability to create wetlands or wetland/stream complex.

- There will be no effect of the channel size or ability to create wetlands or wetland/stream complex. Hydrology is primarily from groundwater.