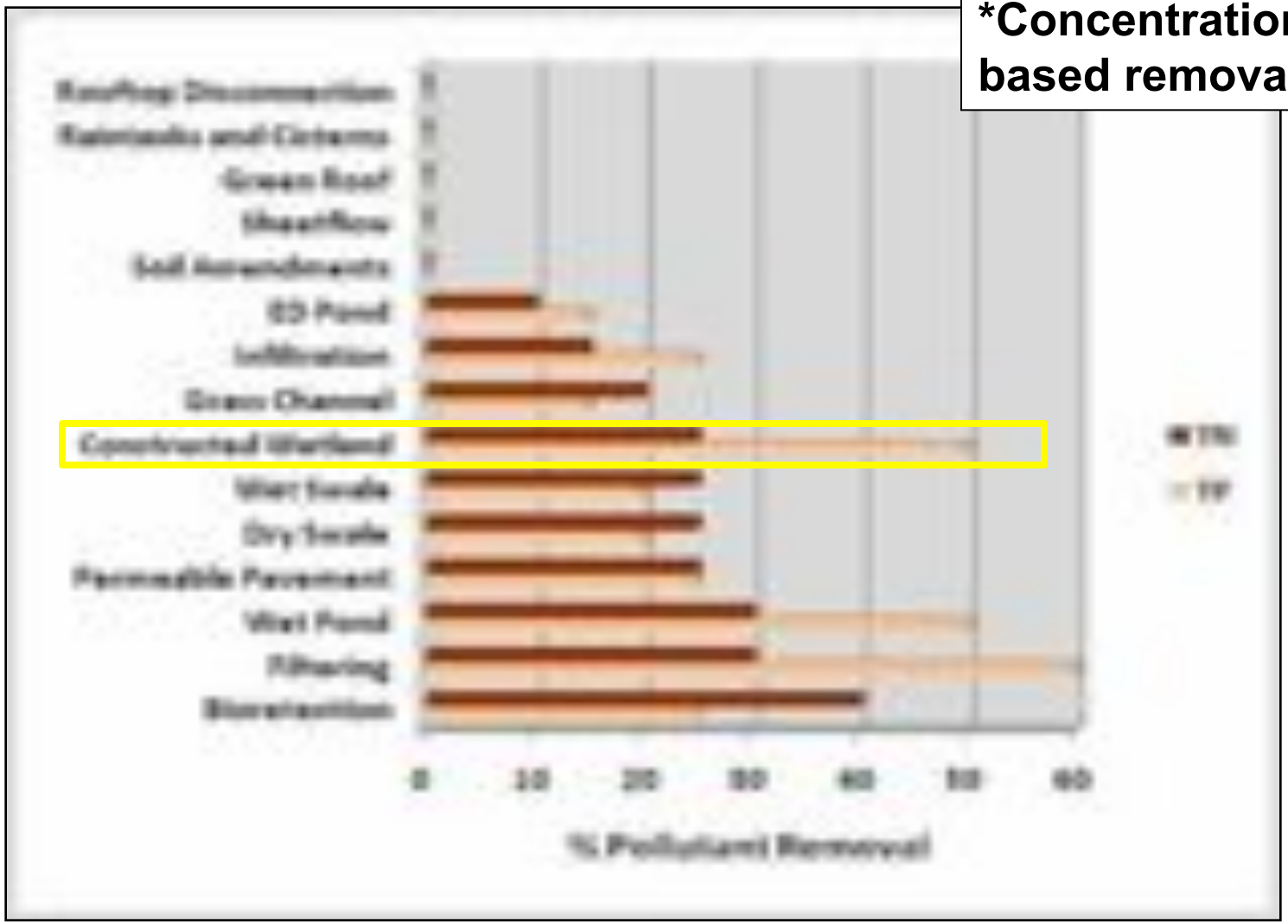
The Wonder of Wetlands

Wetlands are Green Technology

Pollutant Removal Pathways

- Sedimentation
- Adsorption to sediments/vegetation/detritus
- Physical filtration
- Microbial uptake/transformation
- Uptake by wetland plants
- Uptake by algae
- Detention /retention
- Aerobic Respiration
- Anaerobic Respiration
- Nitrification/De-nitrification

Pollutant Removal



Natural Wetland Expressions

Emergent Wetland

Shallow Marsh


Wet Meadow

Deep Water Marsh


Shrub Wetland


Wooded
Wetland


Vernal Pools

Bogs/Fens

The Nelson Swamp

Wetlands Can Start/ Be Started Easily, ……

But, a Good Wetland Takes Time

……and some TLC

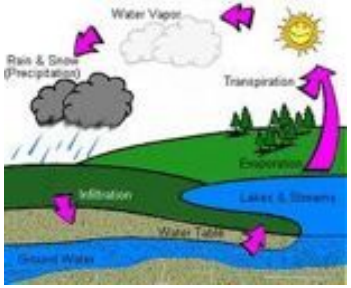
Wetland Ingredients

Hydrology

Soil

Vegetation

Wetlands Need Hydrology to Live



Sources of Hydrology for Wetlands

Surface Flow

Groundwater

From Our Stuff

Stormwater Wetlands Need 25 acres of Surface Flow*

*Unless groundwater or other sources contribute

Wetland Soils

Organics

Gravel

Impermeable Bottom

or

Vegetation

Evolution of Created Wetlands

Pond

Wet Pond

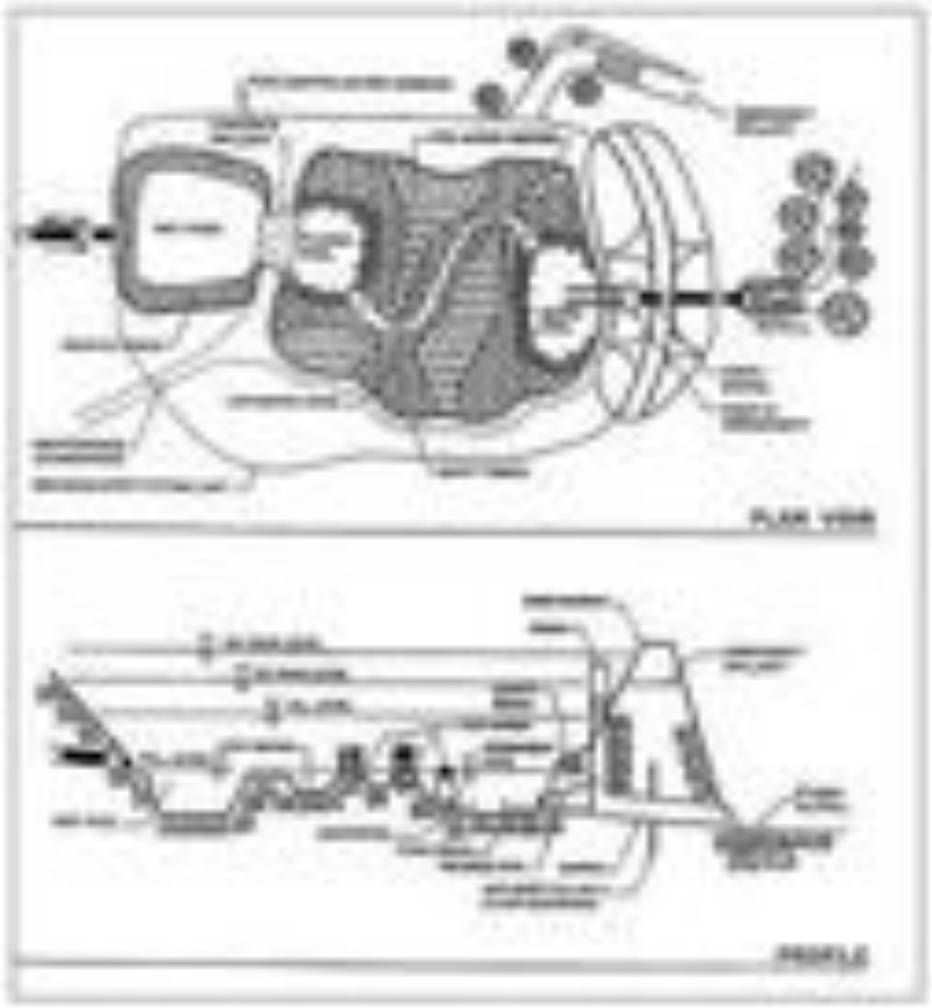
Emergent

Succession

Gravel Based

Regenerative Conveyance

A Good Stormwater Wetland Provides…..



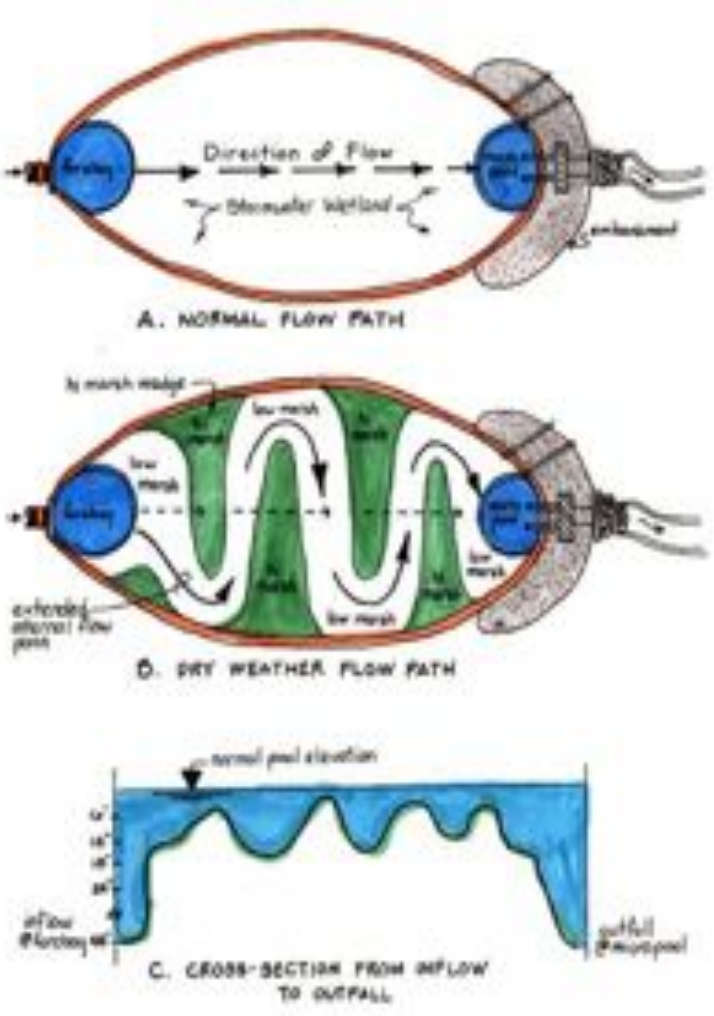
- Peak flow mitigation
- Water Quality Treatment

and

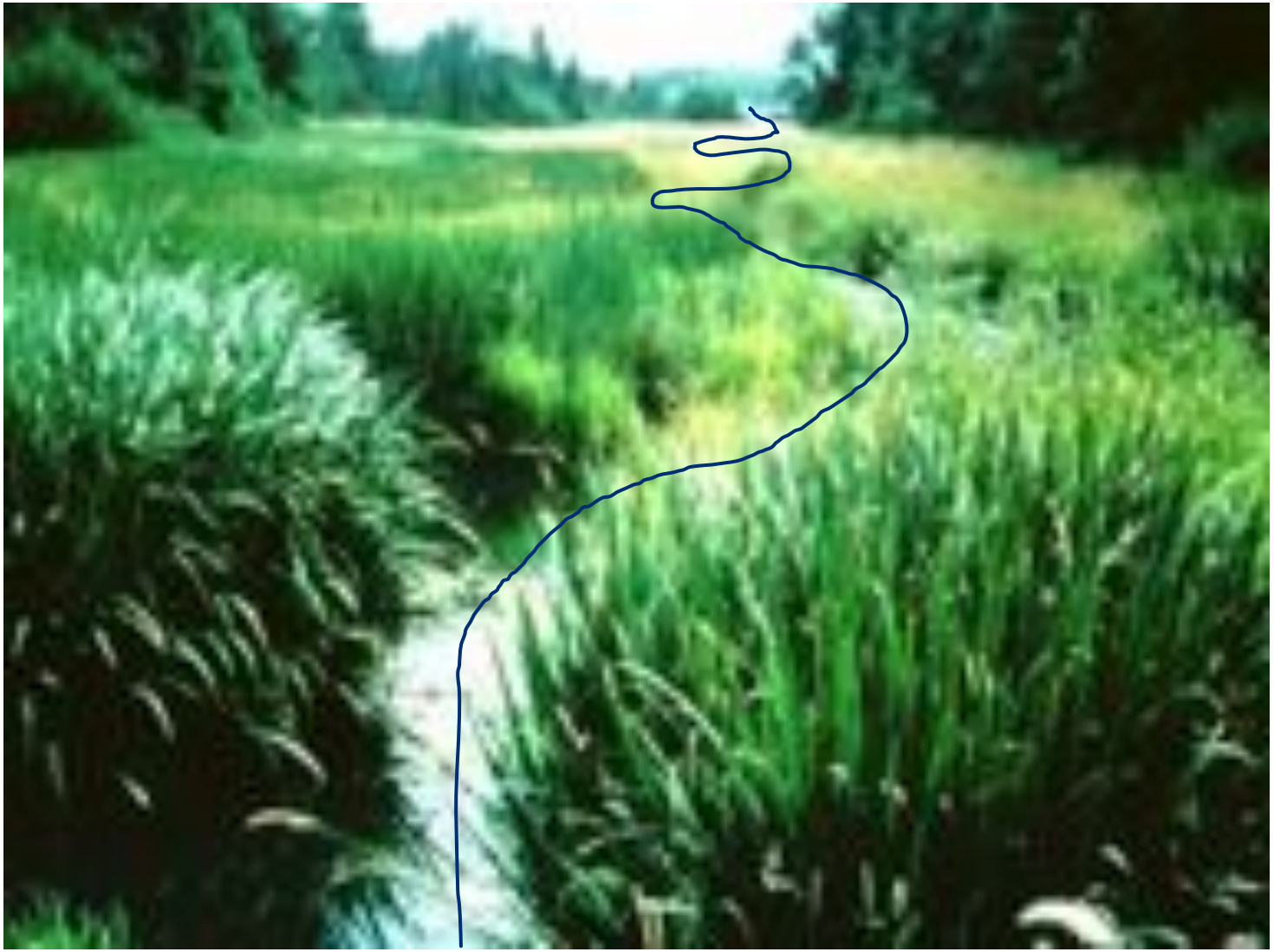
- A Viable Wetland Ecosystem

Wetland Design Elements

- Long Flow Paths
- Large surface area
- Micro topography
- Pre-treatment
- Variable water depths



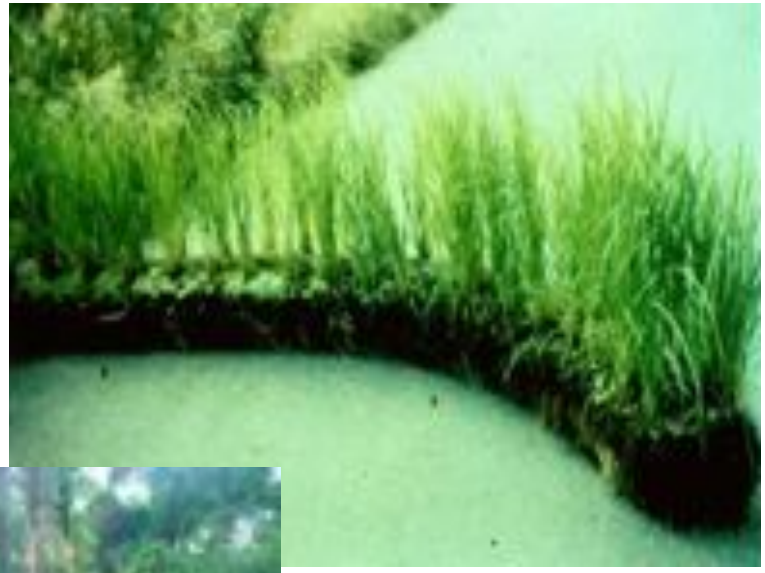
Long Flow Path



Micro-topography

Use at least two mechanisms to create better micro-topography

- Snags
- Inverted rootwads
- Gravel layers
- Cobble sand weirs
- Coir fiber logs
- Scattered pools
- Peninsulas



Water Depths

- Keep Emergent Marsh Zones + 6 to - 6 inches from the normal pool
- Eliminate any marsh zones from - 6 to -18 inches – nothing grows
- Deep water > 4’
- Buffer “flashy “ in-flows
- Avoid excessive depths for temporary flows (< 3ft)

Wetland Flow Management

"First Flush"

– also know as the Water Quality Volume = 90% of all the runoff on a site

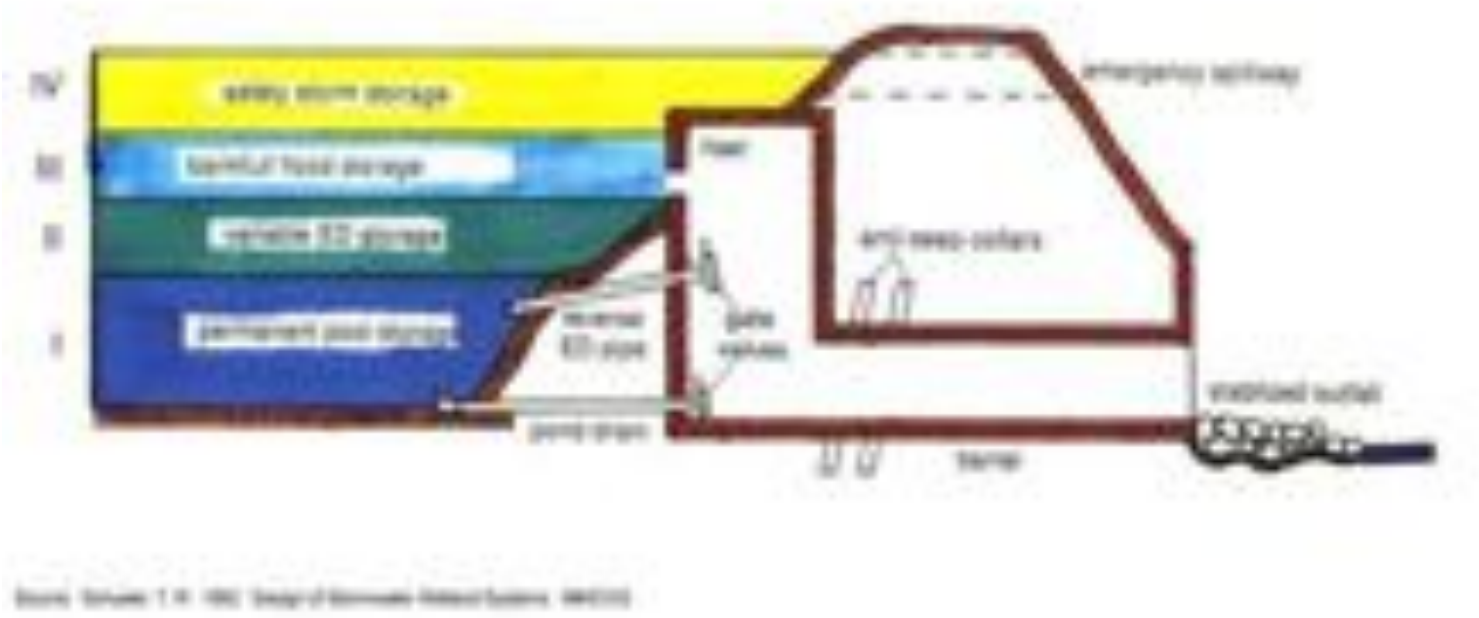
Wetland Flow Management

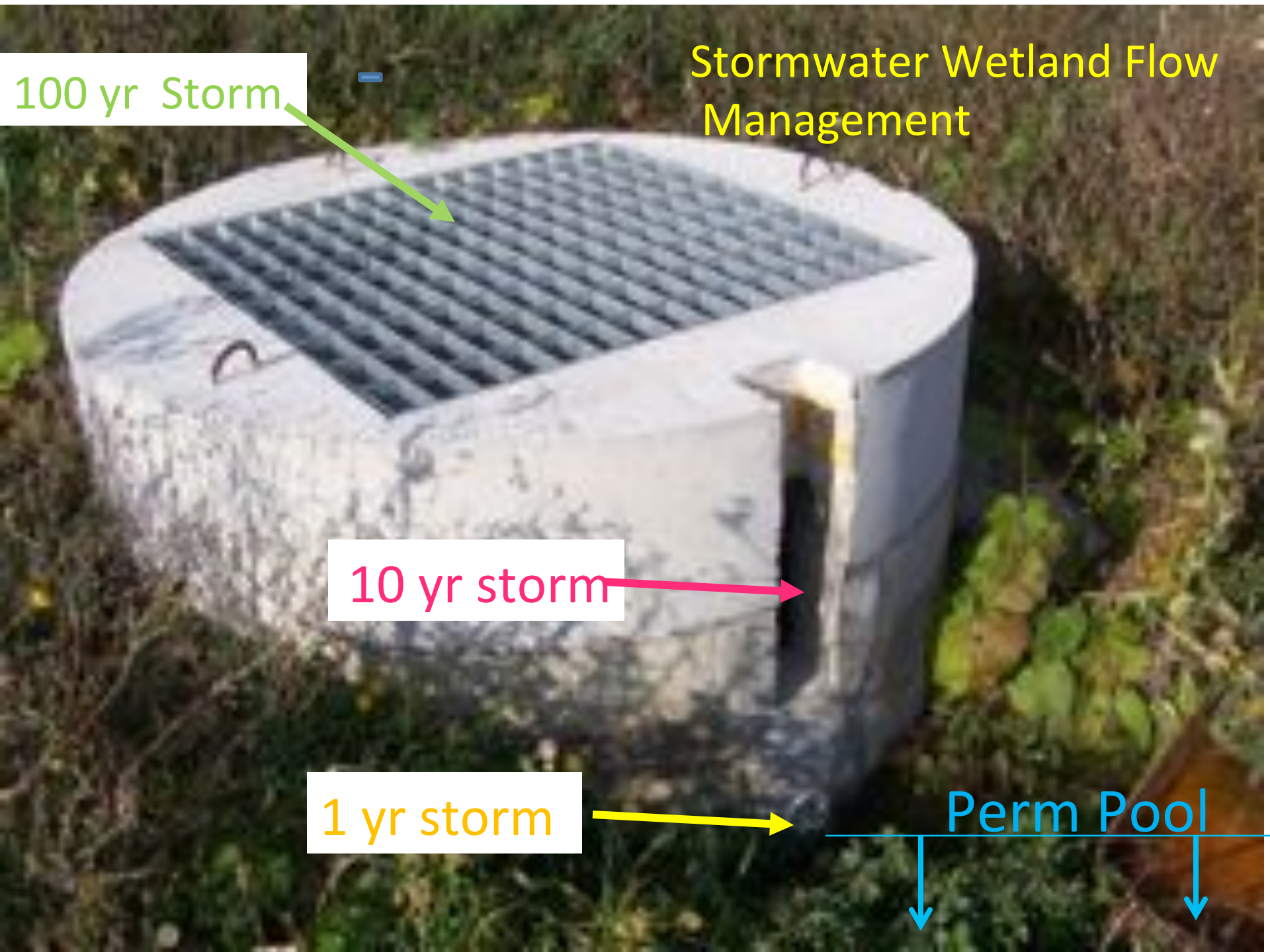
“The Big Flush”

The 100 year Flood

Hydrology Management

Stormwater Wetland Cross Section




Stormwater Wetland Flow Management
100 yr Storm
10 yr storm
1 yr storm
Perm Pool

Wetland Pre-treatment

- Buffers Flashy inflows
- Removes larger sediment particles

Flow Diversion Structure

Water Quality to Wetland

Bypass Pipe for Large Storms

Wetland Vegetation:

Function vs Ecological Diversity

This Works……

…..but this may be better!

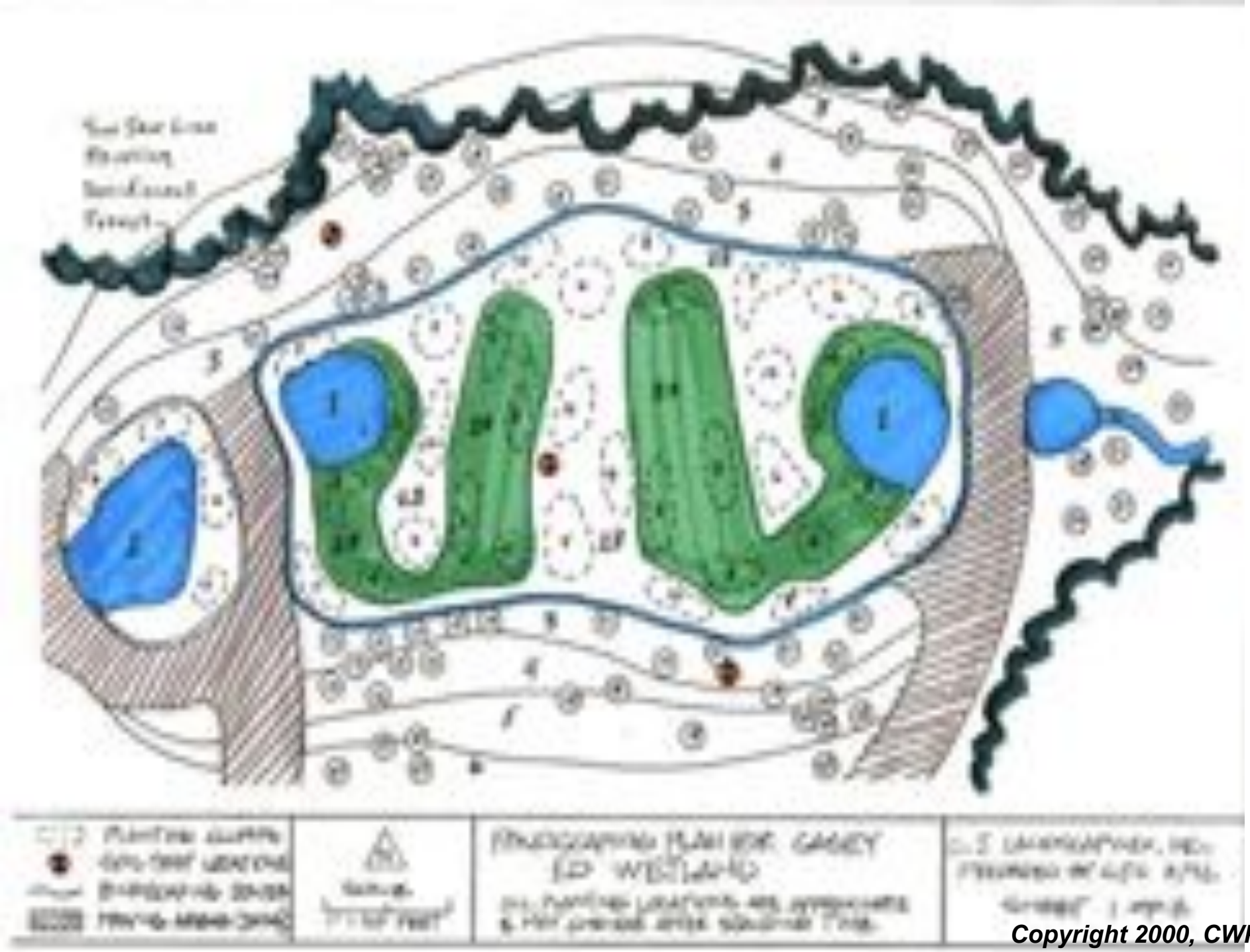
Constructed Wetlands Will Self-Vegetate:

THE INVADERS

Diverse Wetlands Need Landscape Architects!

Engineers Alone

The LA Touch



Pondscaping Zones

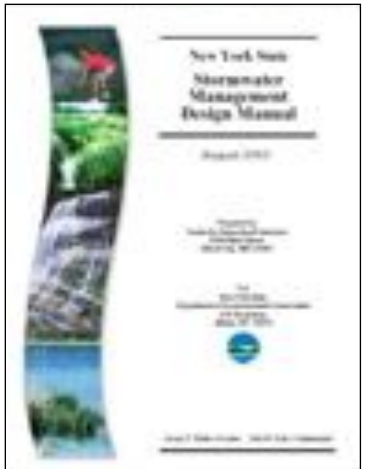
1. Deepwater -1.5 to -6.0 feet
2. Shallow Marsh -1.5 to -0.0 feet
3. Shoreline Fringe 0.0 to 1.0 feet
4. Riparian Fringe 1.0 to 3.0 feet
5. Floodplain Terrace 3 to 6 feet
6. Upland Areas 6 feet +

Seedbanks for Wetland Establishment:

Use existing wetland soil to seed a new wetland

- Needs a permit
- Know what's in it

Wetland Planting Materials: Native and Biodiverse,



Appen. H

The “Bulldogs”

Bulrush

Soft Rush

Switch grass

The Basics

Arrowhead

Spatterdock

Pickerelweed

The Crowd Pleasers

Iris

Swamp Marigolds

Swamp Rose

Shrubs and Trees

Dogwoods

Alders

Swamp Maple

Serviceberry

Red Cedar

Planting A Wetland

- Establish perm pool elev.
- Drain
- Amend Soils
- Grade mico-topo
- Plant on 18” centers in clusters on more than 50% of surface
- Rehydrate
- Monitor, remove invasives, and replace

Before

After

Before

After Planting

1 year later

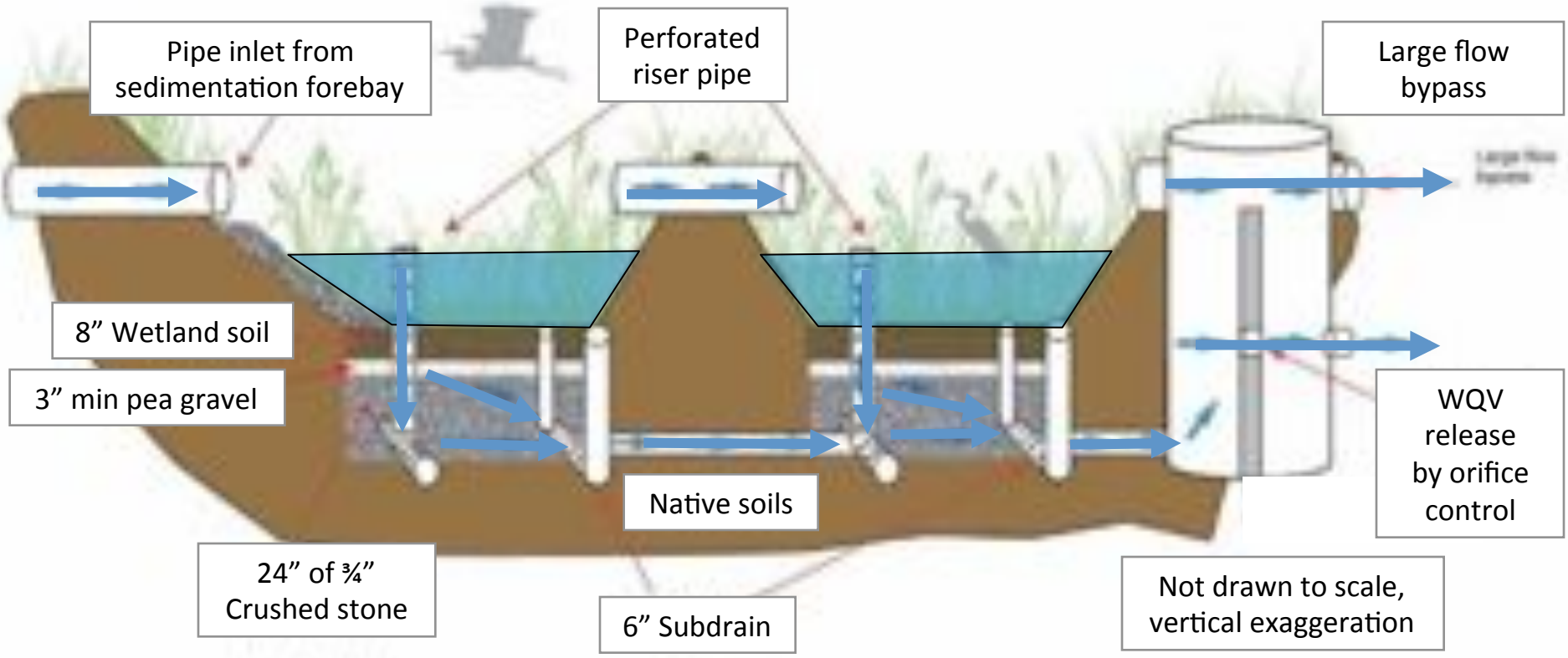

30 years ago

Today

Design Option: Wooded Wetland

Design Choice: Pond Wetlands

Subsurface Gravel Wetland



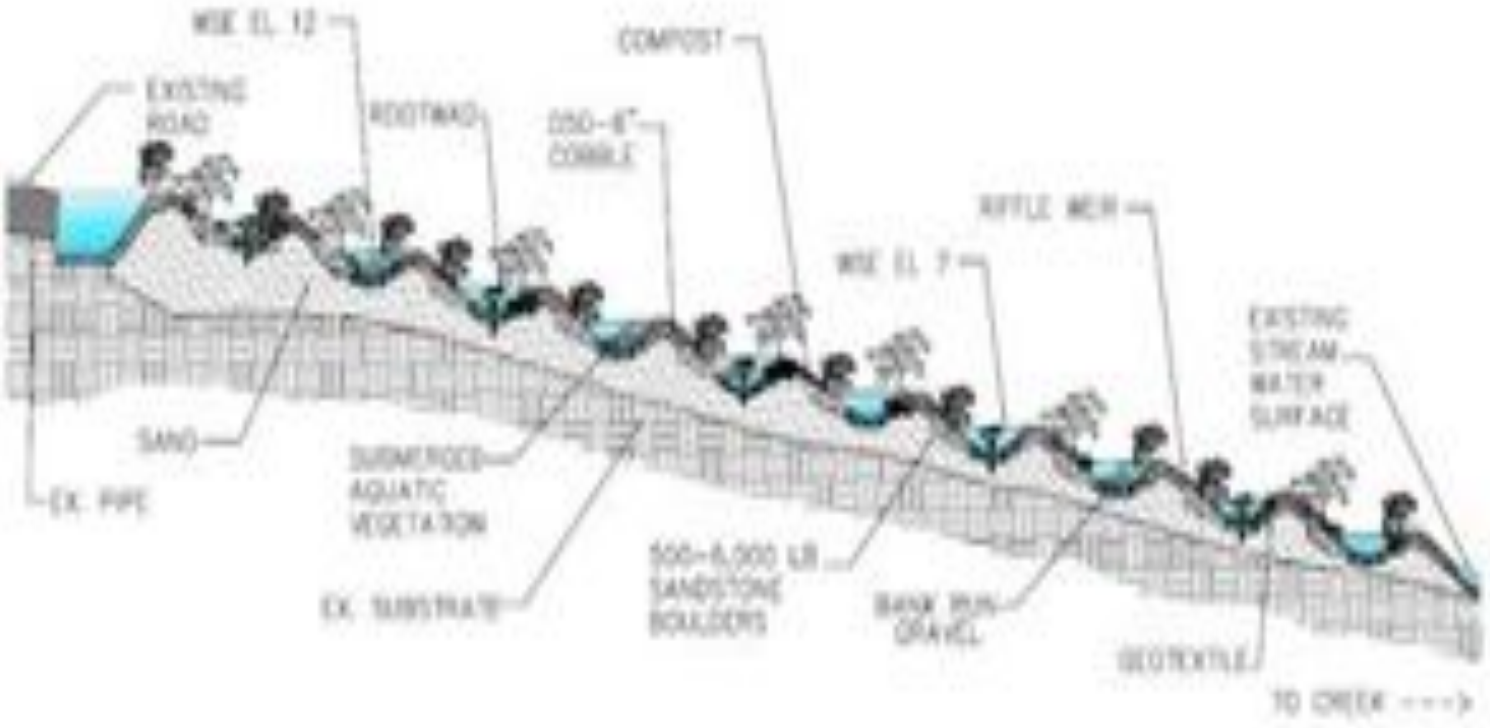
Design Sources:

Claytor, R. A., and Schueler, T. R. (1996). Design of Stormwater Filtering Systems, Center for Watershed Protection, Silver Spring, MD.

Georgia Stormwater Management Manual, Volume 2: Technical Handbook, August 2001, prepared by AMEC Earth and Environmental, Center for Watershed Protection, Debo and Associates, Jordan Jones and Goulding, Atlanta Regional Commission.

STP Treatment Wetland

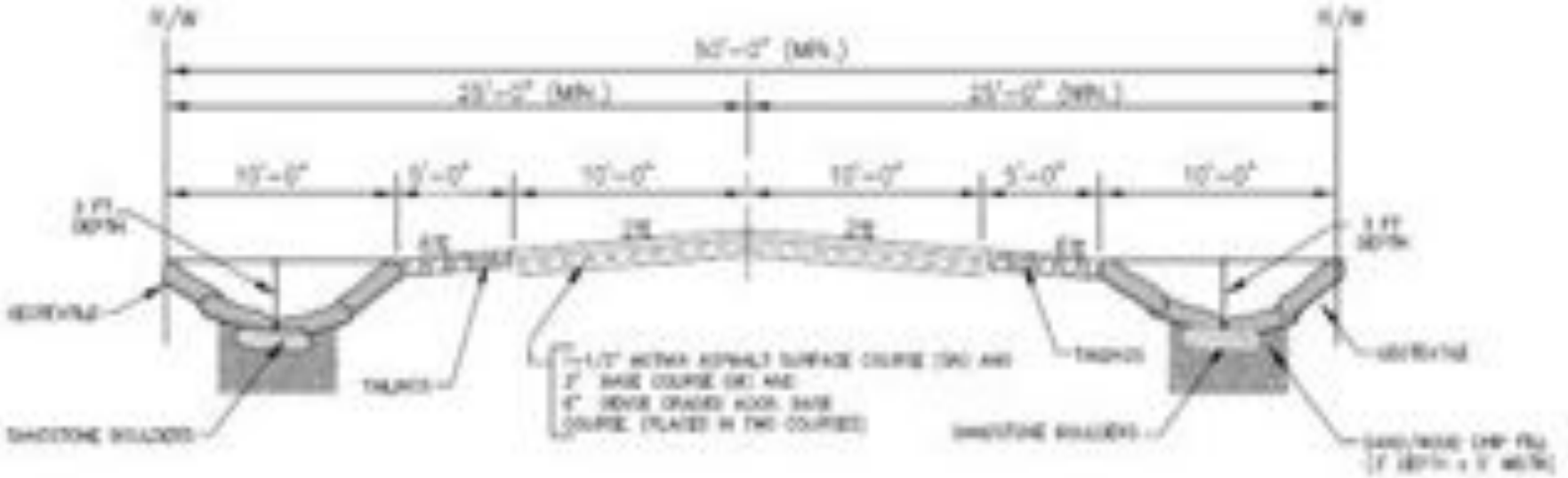
Regenerative Stormwater Conveyance



Basic Building Blocks


Silica cobble
Sandstone boulders

ROAD / REGENERATIVE STORMWATER CONVEYANCE
BOULDER PORTION OF WEIR CROSS SECTION



Ten tenets in the creation of a mitigation wetland: