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# Urban Stream Restoration in Two Case Studies



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# Urban Stream Restoration Cases

## Presentation Outline

- ▶ Principles of Streambank Stabilization Practices in Urban Areas and NE Illinois
- ▶ Morton Arboretum Ecosystem and Stream Restoration Project
  - ▶ Project Overview
  - ▶ Channel Modifications
  - ▶ In-Stream Structures
- ▶ Valley View Pond Restoration
  - ▶ Basin History and Function
  - ▶ Restoration Concepts and Applications
- ▶ Conclusions



# Stream(bank) Stabilization and Riparian Restoration in Northeast Illinois and Urban Areas

- Modifications to Stream Channel and Contributing Watershed
  - Agricultural Impacts
  - Urbanization
- Incised Streams with Severe Bed Erosion and Downcutting
  - Signified by Head Cut Migration
  - Steep, nearly vertical banks
  - Disconnection from historic floodplain

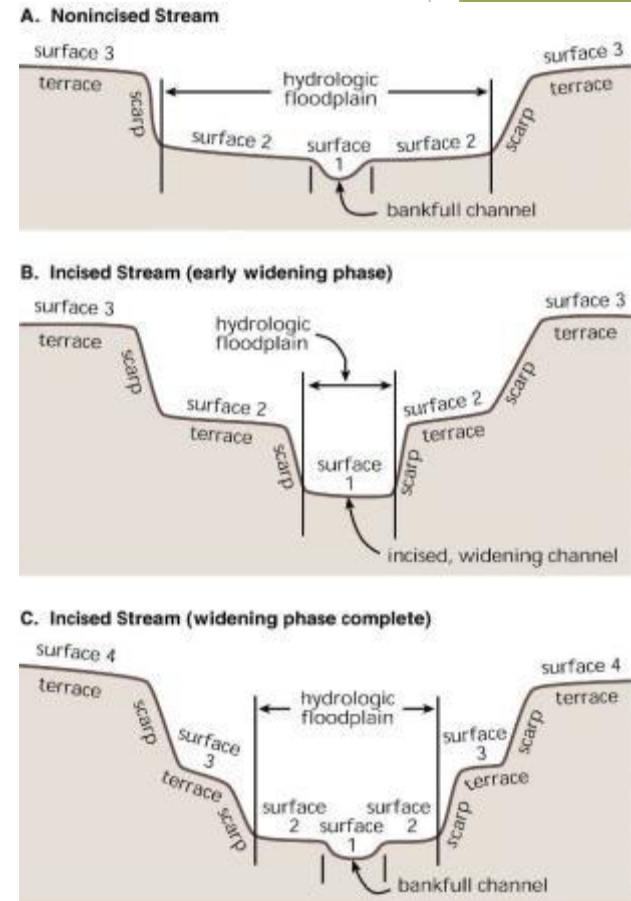


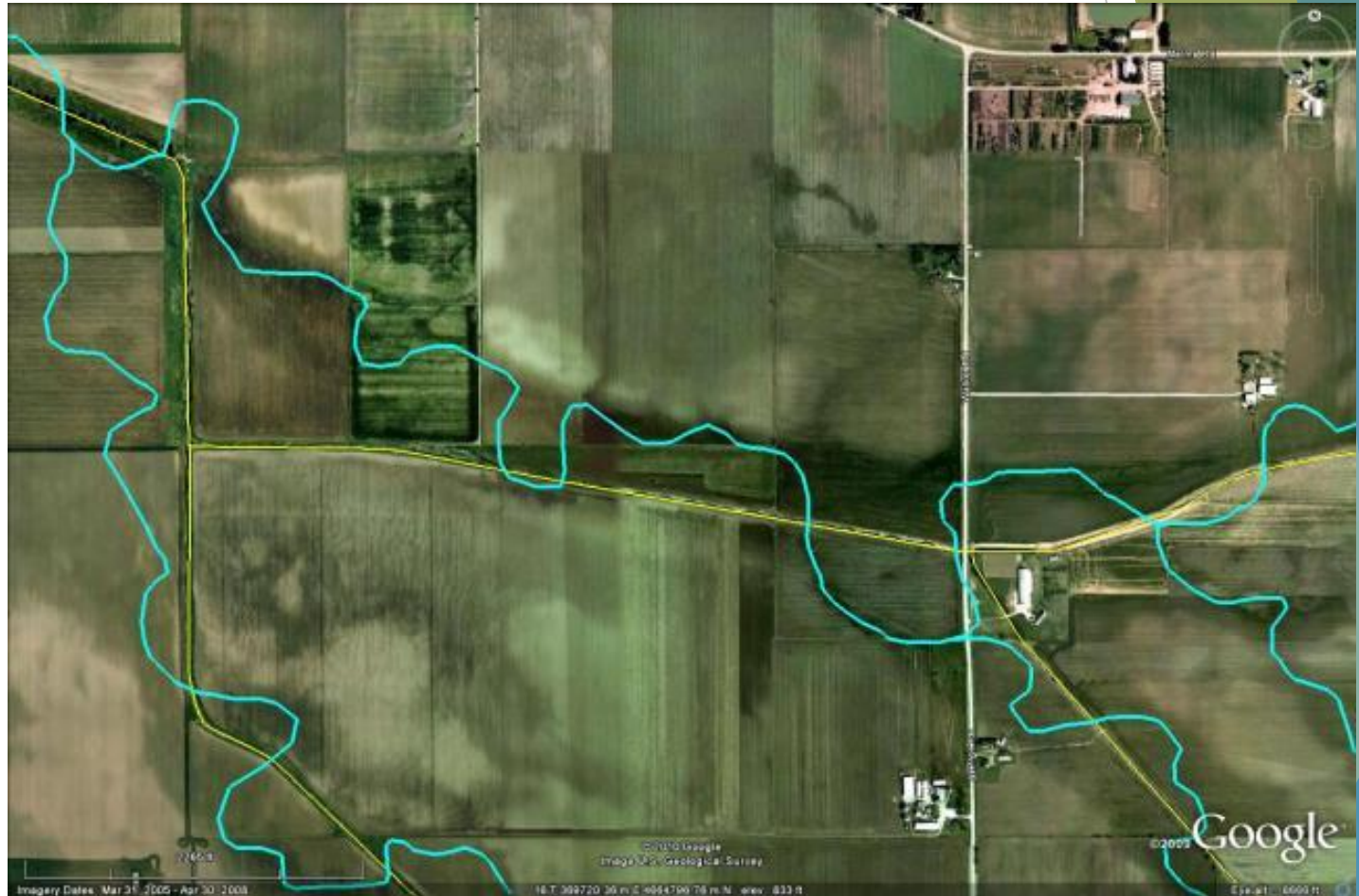
Fig. 1.24 – Terraces in (A) nonincised and (B and C) incised streams. Terraces are abandoned floodplains, formed through the interplay of incising and floodplain widening. In Stream Corridor Restoration: Principles, Processes, and Practices (10/98), Intermountain Stream Restoration Working Group (15 federal agencies)/FISRWG.



# Stream Stabilization and Riparian Restoration in Northeast Illinois

## ► Modifications to Stream Channel and Contributing Watershed

Agricultural  
Impacts



# Stream Stabilization and Riparian Restoration in Northeast Illinois

## ► Modifications to Stream Channel and Contributing Watershed

Urbanization



# Stream Stabilization and Riparian Restoration in Northeast Illinois

## ► Modifications to Stream Channel and Contributing Watershed

### Urbanization

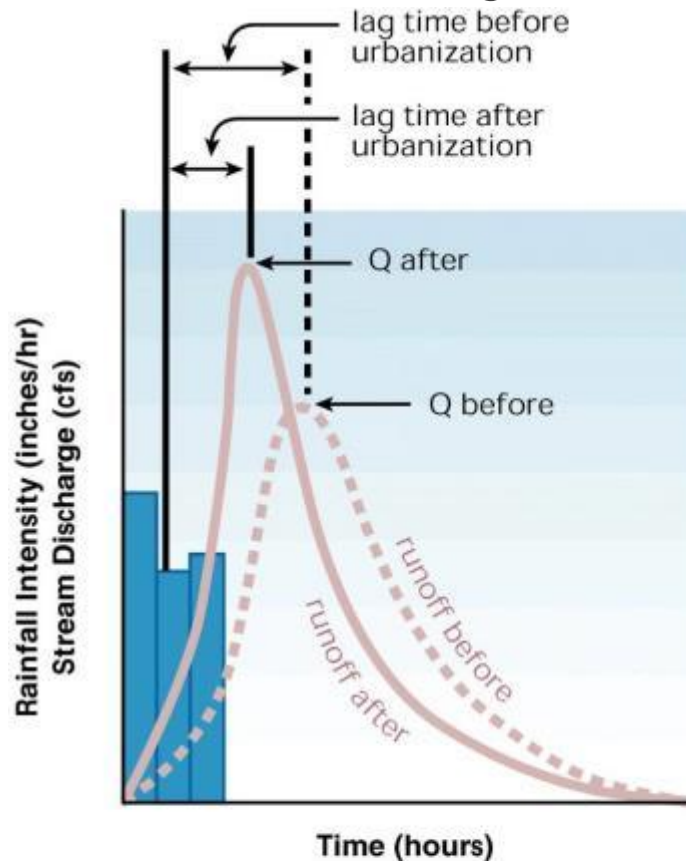


Fig. 1.15 – A comparison of hydrographs before and after urbanization. The discharge curve is higher and steeper for urban streams than for natural streams. In Stream Corridor Restoration: Principles, Processes, and Practices (10/98). Interagency Stream Restoration Working Group (15 federal agencies)(FISRWG).



# Stream Stabilization and Riparian Restoration in Northeast Illinois

## ► Modifications to Stream Channel and Contributing Watershed

Urbanization



# Stream Stabilization and Riparian Restoration in Northeast Illinois

## Strategies to Address Incised Streams

1. Reconnect stream with historic floodplain
2. Recreate new floodplain between historic floodplain and the elevation of the incised streambed
3. Modify existing channel type and dimensions at existing streambed
4. Stabilize banks in place





# Morton Arboretum - East Branch of the DuPage River Restoration

- Urban River and Watershed through private Arboretum and open space





## ► Project Area



# Project Restoration Principles

## Bank Reshaping

- Expand cross sectional area to reduce velocity

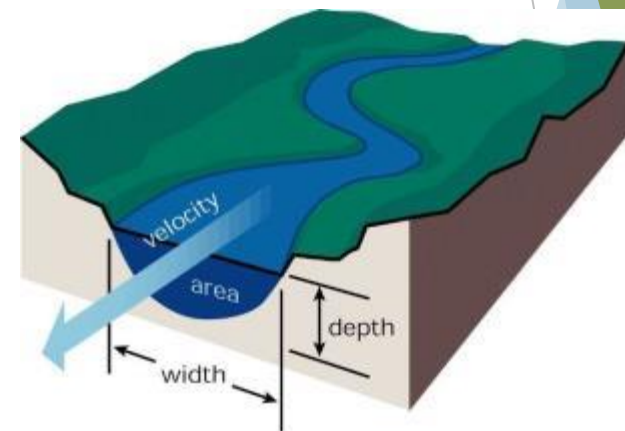
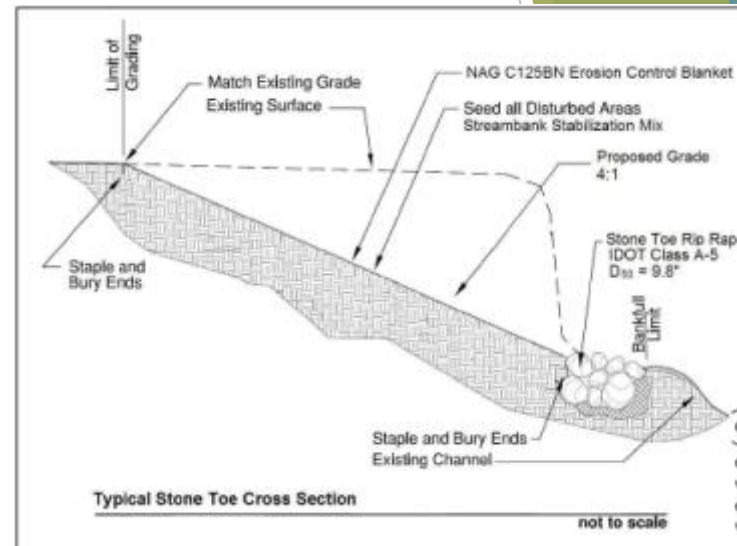
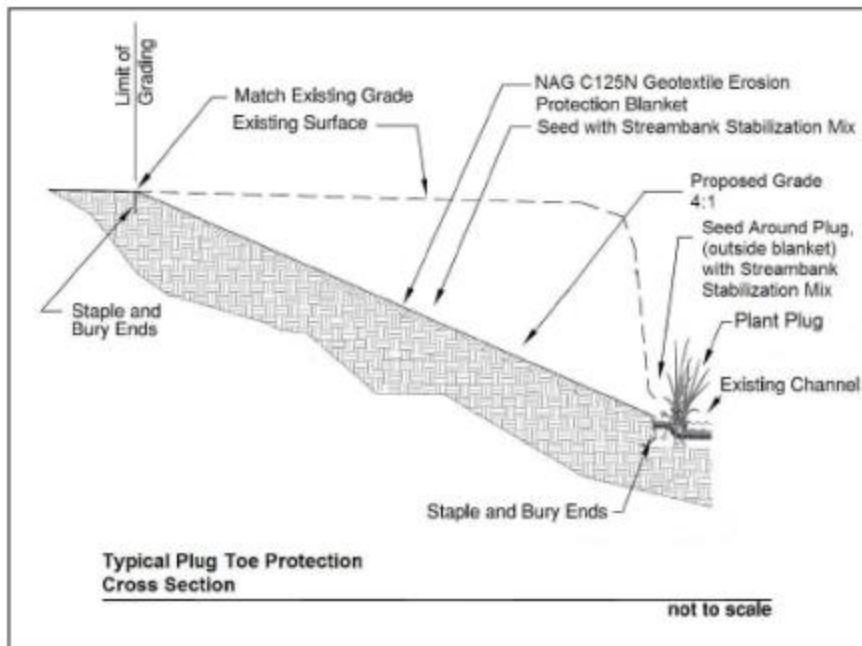


Fig. 1.18 - Channel discharge. Discharge is a product of area times velocity. In Stream Corridor Restoration: Principles, Processes, and Practices (10/94). Interagency Stream Restoration Working Group (15 federal agencies)(FISRWG).



# Morton Arboretum - Bank Reshaping

## ► Bank Reshaping





# Morton Arboretum - Bank Reshaping

## ► Bank Reshaping





# Morton Arboretum - Bank Reshaping

## ► Flooding During the “dry season”





# Morton Arboretum - Bank Reshaping

- ▶ Bank Stabilization with seeding and erosion blanket





# Morton Arboretum - Bank Reshaping

## ► Bank Grading Comparison

### ► Before





# Morton Arboretum - Bank Reshaping

## ► Bank Grading Comparison

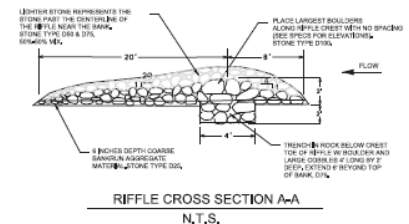
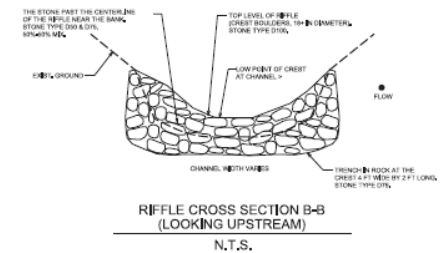
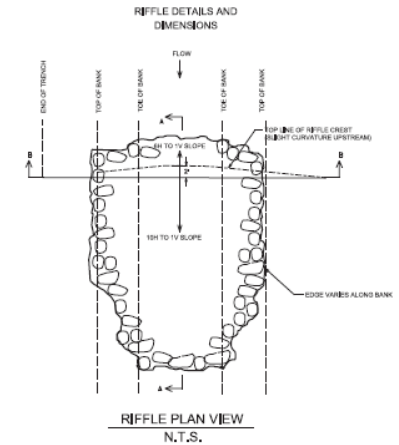
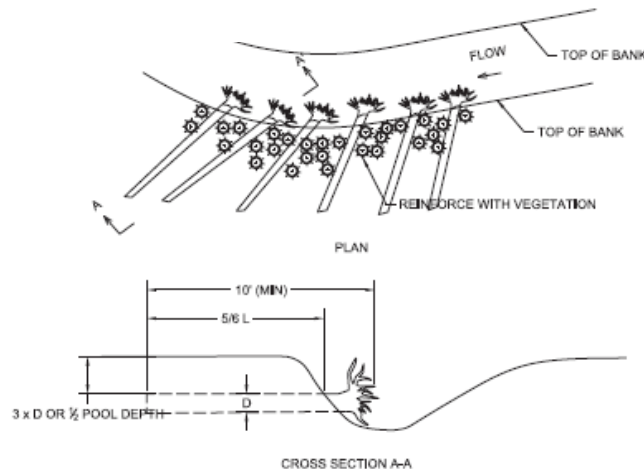
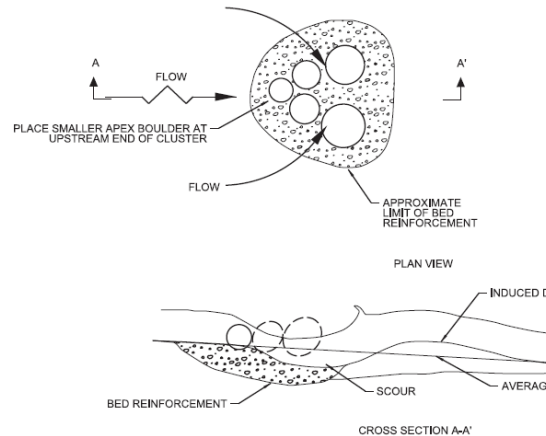
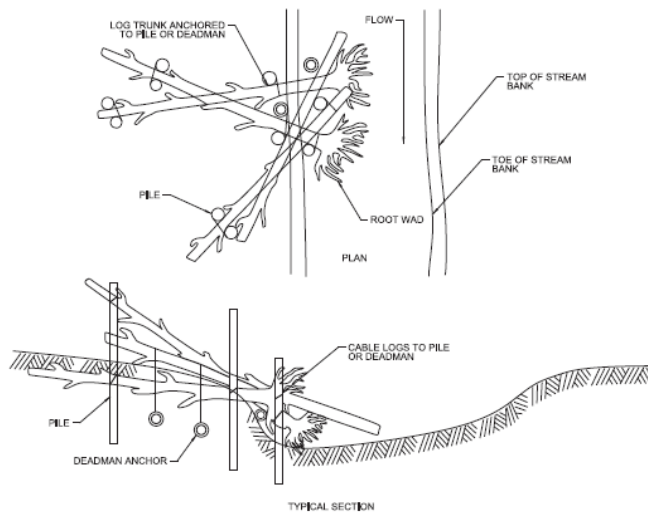
### ► After



# Project Restoration Principles

## ► In-Stream Structures

### ► Provide habitat and stabilization



#### RIFFLE NOTES

1. RIFFLE CREST SHALL HAVE A SLIGHT CURVATURE TO DIRECT LOW FLOWS TO THE CENTER OF THE RIFFLE (SEE PLAN VIEW FOR DETAILS).
2. REFER TO SPECIFICATIONS FOR FULL SIZE AND OTHER RIFFLE DETAILS.



# Morton Arboretum - In-Stream Structures

## ► Boulder Clusters





# Morton Arboretum - In-Stream Structures

## ► Boulder Clusters





# Morton Arboretum - In-Stream Structures

## ► Rock Riffles





# Morton Arboretum - In-Stream Structures

## ► Rock Riffles





# Morton Arboretum - In-Stream Structures

## ► Rock Riffles





# Morton Arboretum - In-Stream Structures

## ► Rootwad Revetments - Woody Debris Clusters





# Morton Arboretum - In-Stream Structures

## ► Rootwad Revetments - Woody Debris Clusters





# Morton Arboretum - In-Stream Structures

## ► Rootwad Revetments - Woody Debris Clusters





# Morton Arboretum - In-Stream Structures

## ► Rootwad Revetments - Woody Debris Clusters





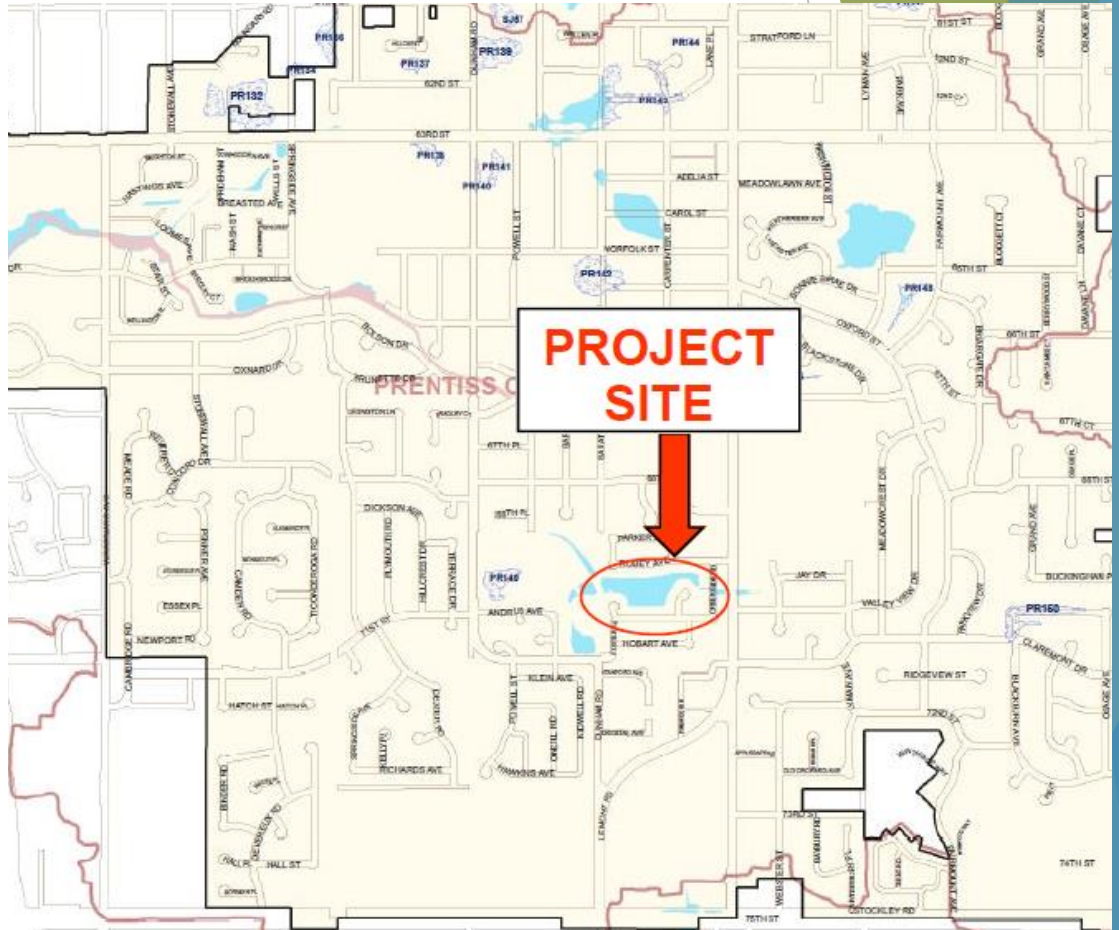
# Valley View Pond Restoration





# Village of Downers Grove & Valley View Pond

- ▶ Pond was constructed as in-line detention in existing depressional area in intermittent stream through an agricultural field
- ▶ Pond was deeded to Village by original land developer
- ▶ Little to no maintenance was performed since initial construction in the 1970s



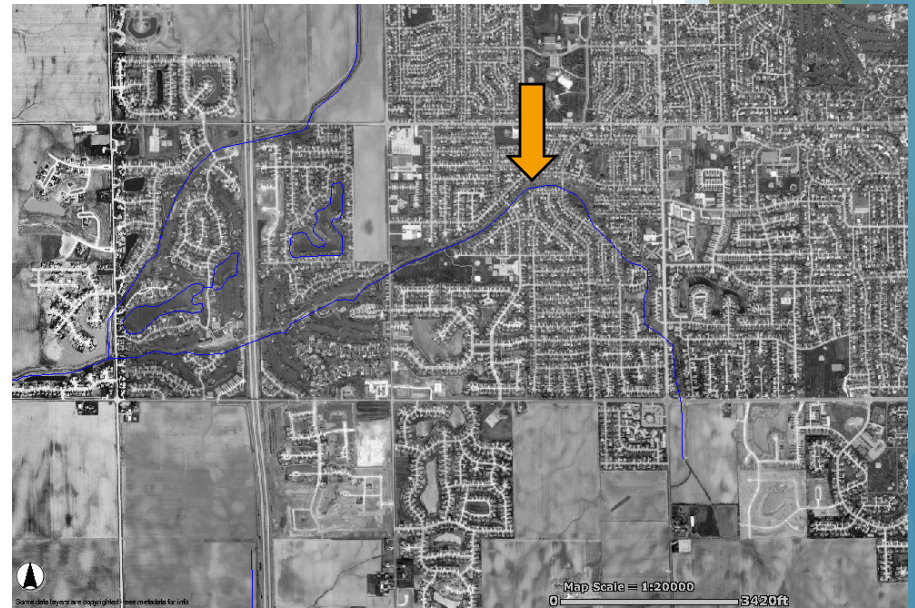
Credit – Ted Gray, Living Waters Consultants, Inc.

# Urbanization and Development Prentiss Creek Watershed

400 Acre  
Contributing  
Watershed



1930s

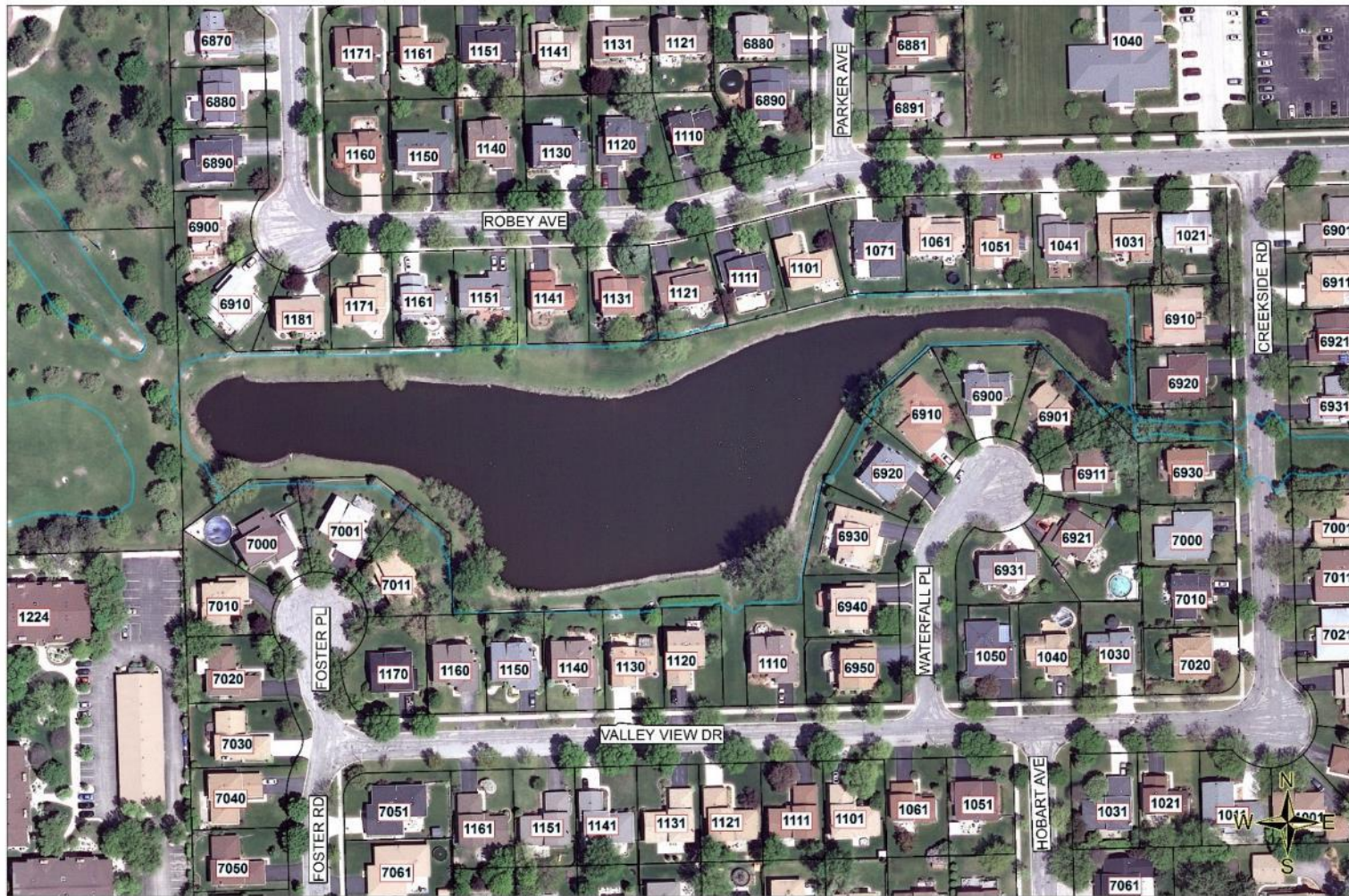


1990s



# Valley View Pond Site

2.6 Acre Surface Area





# Existing Conditions



- Water Depth  
3-4feet or  
Less
- Silt Impacts
- Algae Blooms
- Odors
- Water Quality  
Impairment

Credit: Ted Gray – Living Waters Consultants



# Existing Impacts



Credit: Ted Gray – Living Waters Consultants



Credit: Ted Gray – Living Waters Consultants



# Bank Stabilization & Naturalization Concept Plan



Credit: Ted Gray – Living Waters Consultants

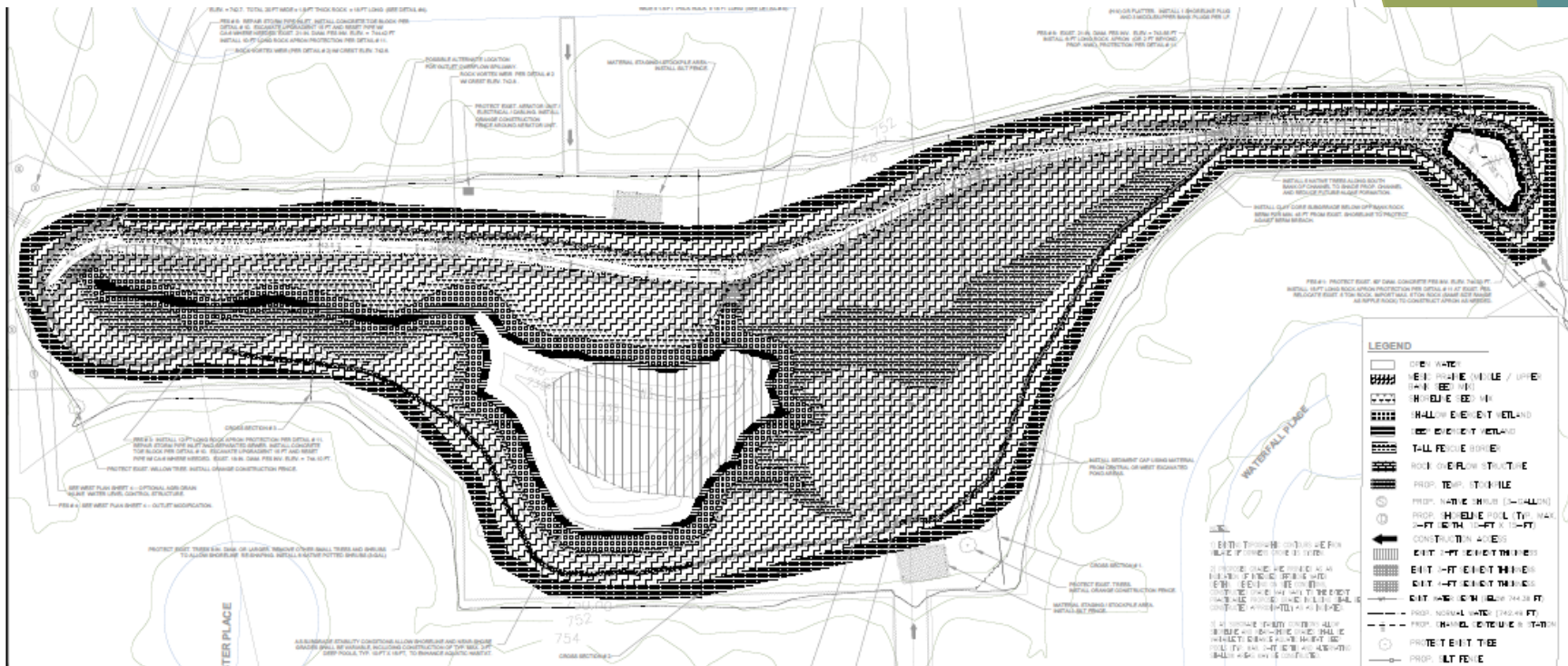


# Valley View Pond Improvement Plan Design Goals

- ▶ Focus on sediment transport and passage
- ▶ Provide element of open water for residents
- ▶ Improve water quality through aeration and low flow channel
- ▶ Provide improved habitat and geese deterrent
- ▶ Mitigate or reduce algae blooms
- ▶ Increase flood storage capacity



# Final Improvement & Planting Plan





# Preconstruction Photos



Shoreline dominated by invasive species and woody trees and shrubs





# Construction - Outlet Lowering and Draw Down





# Construction - Outlet Lowering and Draw Down



Initial Pond Drawdown





# Off-Shore Berm Construction





# Construction Photos

Clay Berm Separating Channel From Pond Area





# Open Water Area Construction

Clay Borrow Pit & Open Water Area Construction





# Open Water Area Construction

Clay Borrow Pit & Open Water Area Construction





# Construction Photos

The “Ooze”





# Construction Photos

Displacing the “Ooze”





# Construction Photos

Displacing the “Ooze”





# Construction Photos

Displacing the “Ooze”





# Construction Photos

## The Bowl





# Construction Photos

Displacing the “Ooze”





# Construction Photos

## Completion of Rock Toe on Upper Channel Section





# Construction Photos

Completion of Rock Toe on Upper Channel Section & Topsoil Placement





# Construction Photos

Completion of Rock Toe on Upper Channel Section & Topsoil Placement





# Construction Photos

Completion of Rock Toe on Upper Channel Section & Topsoil Placement





# Construction Photos

Making Connection From Open Water Area to south stormwater inlet





# Construction

A look at the soil conditions





# Construction Photos

## Stabilization of Channel





# Construction Photos

## Stabilization





# Construction Photos

Watch you step.





# Post-Construction

Within a week it's almost a guarantee.....flooding.





# Post-Construction

Within a week it's almost a guarantee.....flooding.





# Post-Construction

Within a week it's almost a guarantee.....flooding.





# Post-Construction

3 Days time for draw down





# Post-Construction

3 Days time for draw down





# Post-Construction

Overflows stable and functional





# Post-Construction

## Current Conditions





# Post-Construction

South forbay and transition wet-mesic to emergent area





# Post-Construction

Open Water/Wetland transition to channel





# Post-Construction

## North Stream Channel





# Post-Construction

North Stream Channel Riffle and mesic to wet mesic zone in south





# Post-Construction

North Stream Channel and South wetland/Open Water facing west





# Post-Construction

## Vegetative Establishment and Maturity





# Post-Construction

## Vegetative Establishment and Maturity





# Post-Construction

## Vegetative Establishment and Maturity





# Post-Construction

## Vegetative Establishment and Maturity





# Conclusions

- ▶ Design and construction of streambank stabilization practices must take into account upstream and downstream conditions from the “treated” stream segment
- ▶ Experienced, interdisciplinary design and construction teams are necessary to ensure a successful project
- ▶ Projects must take into account realistic constraints of the project scope
- ▶ Hard and soft armoring of streambanks must be carefully selected based on the dynamics of the project and needs of stream system
- ▶ Thinking outside the box is often necessary to accomplish project goals



# Questions?



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