Erosion and Flood Management in Agricultural Streams: *Nature-Based Infrastructure in the Nottawasaga River Watershed*

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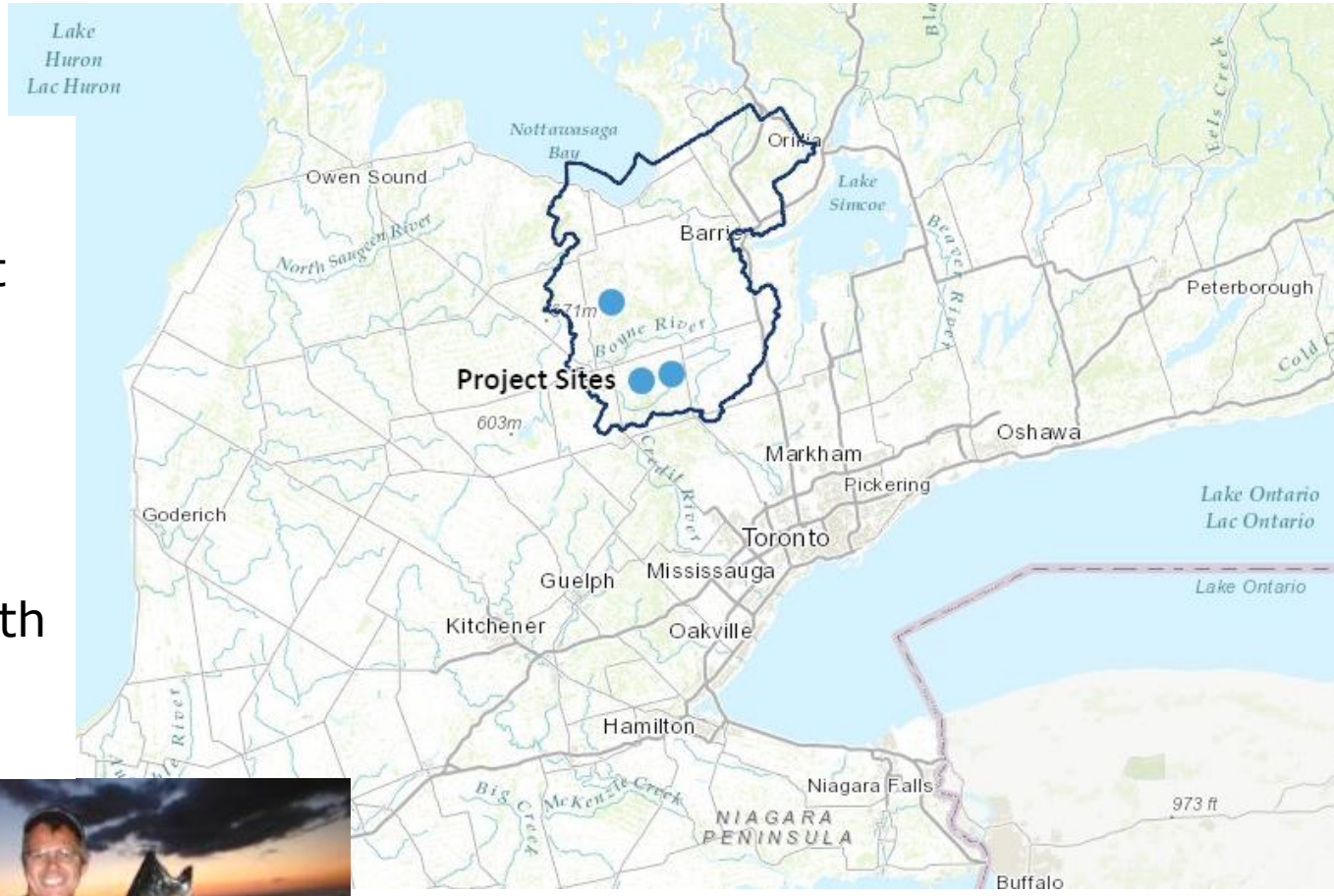
Laura Wensink, BSc. CERP, River Restoration Technician
Nottawasaga Valley Conservation Authority

Nottawasaga Valley Watershed

- 3,700km^2 and flows into Georgian Bay at Wasaga Beach
- Primarily rural with rapidly growing urban centers, and significant growth pressure



59.7% loss of wetland between 1800 and 2002 according to data from Ducks Unlimited

Home to species at risk Lake Sturgeon and native lamprey which reproduce in some of the same riffles as sportfish.

Nature Based Infrastructure's Missing Piece

Nature-Based Infrastructure (NBI) is gaining traction as a resilient alternative to conventional flood and erosion management. Recent funding in Ontario has emphasized wetlands and stormwater systems, but excluded natural channel systems and floodplains.

Why aren't natural channels considered critical infrastructure?

Why Natural Channels Should Be Recognized as NBI

Natural channels provide:

- Flood attenuation
- Sediment management
- Water quality treatment
- Climate adaptation
- Agricultural resilience

Stream restoration delivers the same core services that policymakers seek from Nature-Based Infrastructure

Sheldon Creek

The Challenge: Rural Land Use and Stream Degradation

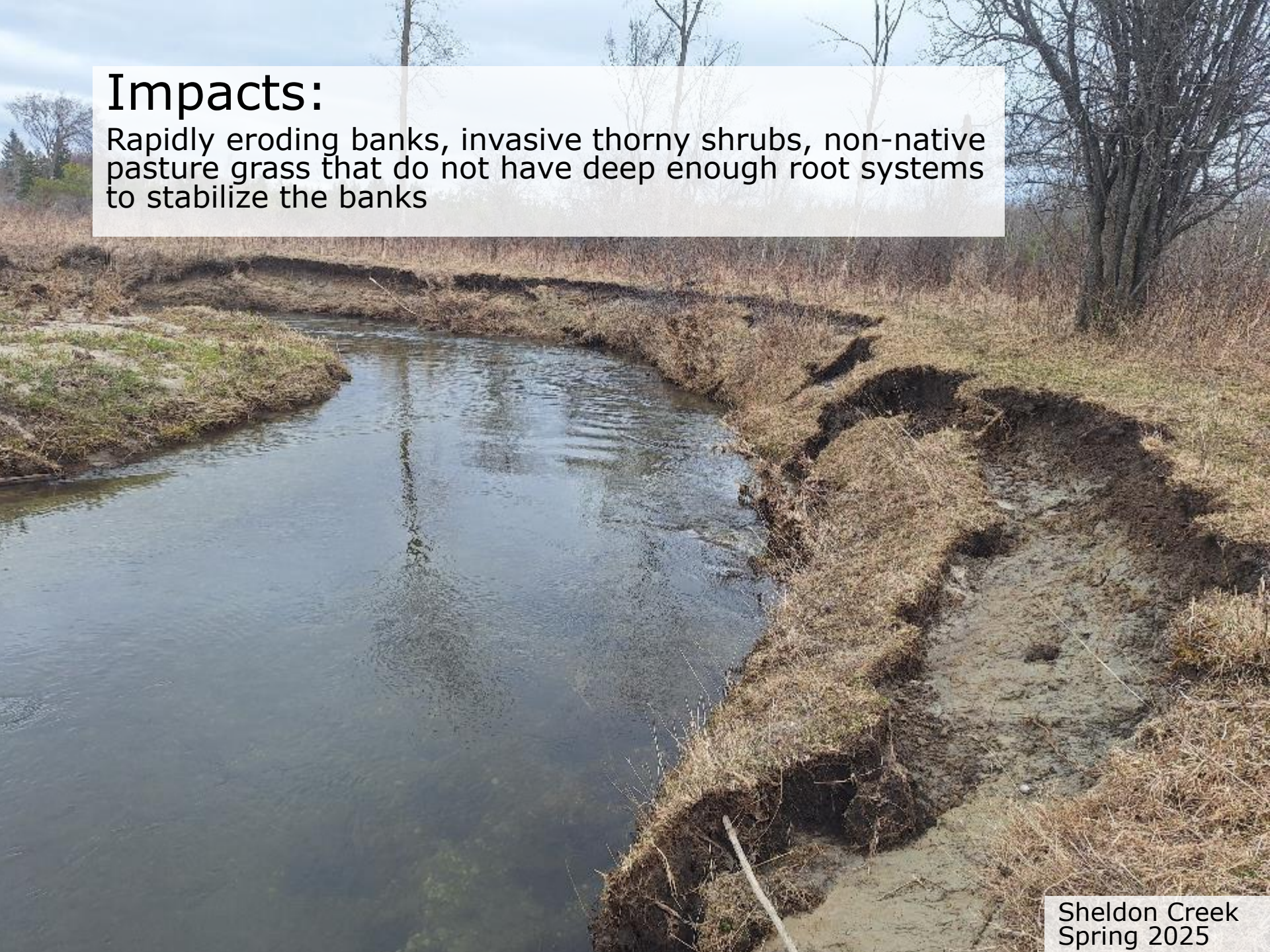
Agricultural impacts on this site include:

- Historic land clearing of riparian forest
- Trampled banks suppressing regrowth of riparian vegetation
- Excess erosion and sediment
- Nutrient loading and *E.coli*

Sheldon Creek
Summer 2022

Impacts:

Rapidly eroding banks, invasive thorny shrubs, non-native pasture grass that do not have deep enough root systems to stabilize the banks



Sheldon Creek
Spring 2025

Infrastructure Consequences:

- Loss of farmland
- Rapid erosion threatens roads, bridges, culverts
- Floodplain disconnection leads to higher flood peaks, potential for more damage downstream
- Reduced water quality downstream at Wasaga Beach can cause beach closures

Sheldon Creek
Spring 2020

Ecological Consequence

Lack of riparian forest cover

Rapid warming of cool-water streams

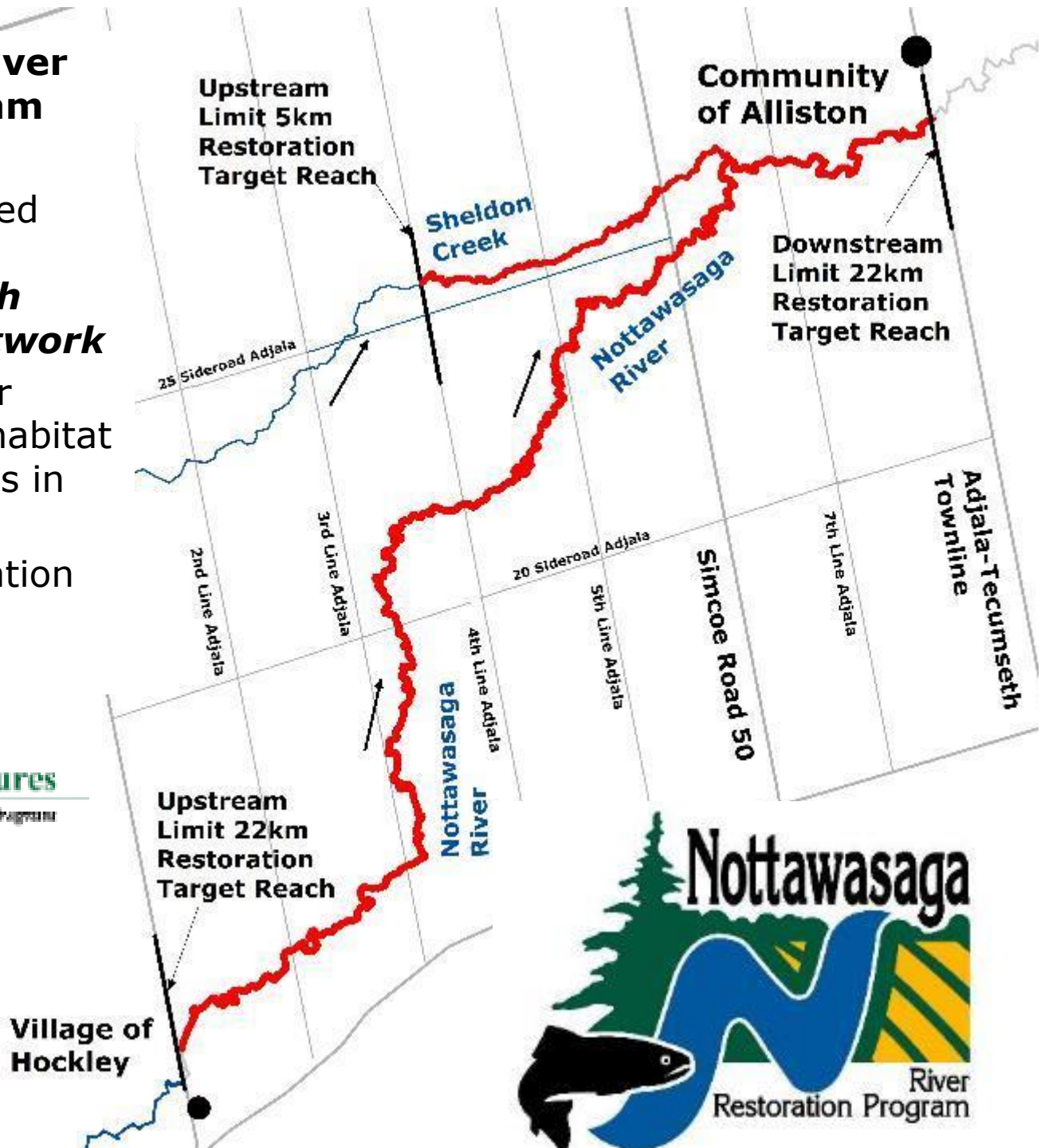
Excessive sediment and phosphorus

Decline in water quality

Youth seeing a native Species at Risk the Northern Brook Lamprey for the fist time.

The Nottawasaga River Restoration Program

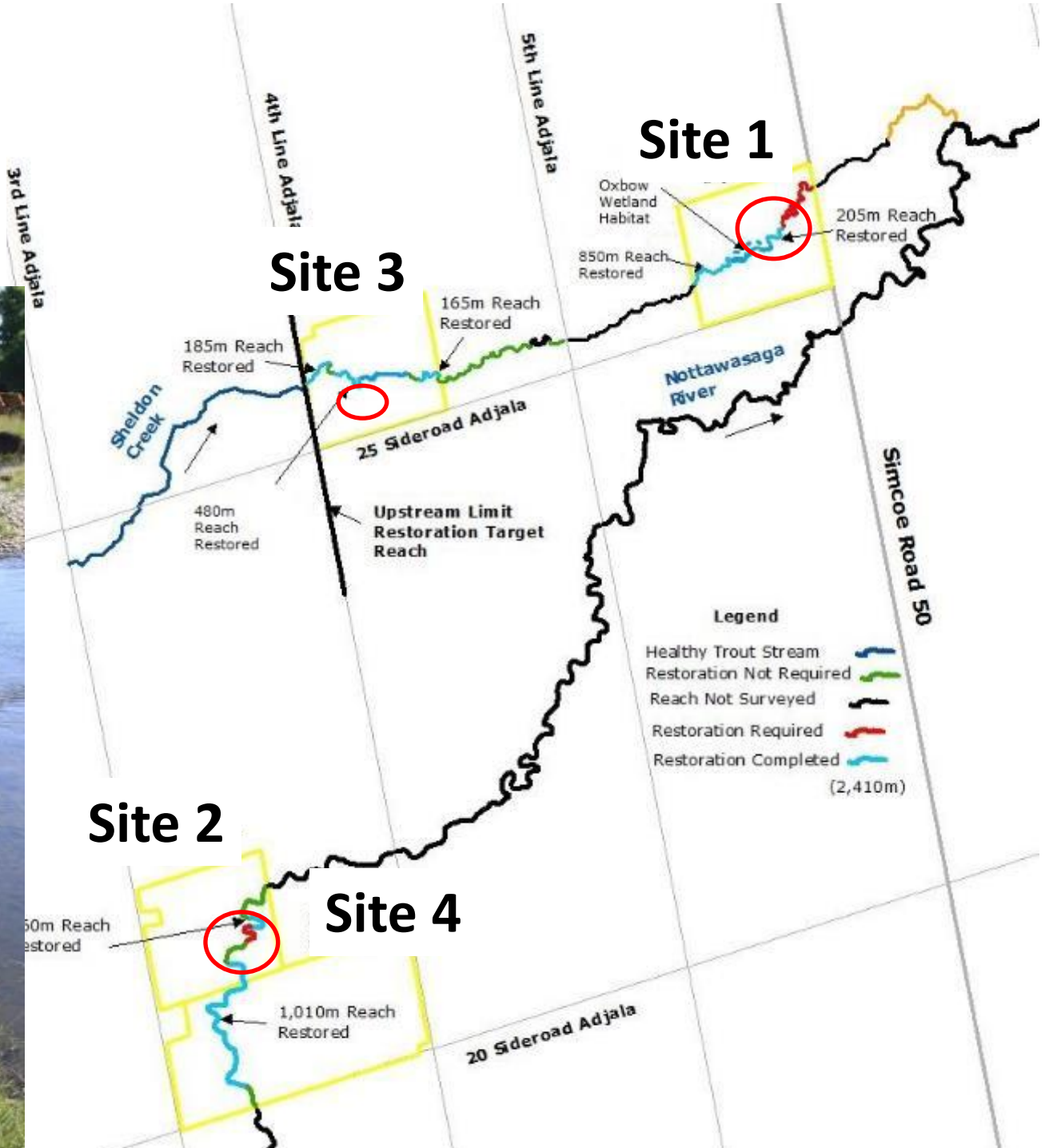
- initiated in 2018 by Fred Dobbs (retired) in partnership with ***South Simcoe Streams Network***
- one of the largest river restoration and trout habitat improvement programs in southern Ontario
- **4.6km** of river restoration 2019-2025



Nottawasaga Futures
South Simcoe Stream Network Program

Nottawasaga River Restoration Program

2018-2026 Nottawasaga River Restoration Program Sites



Five Step Bank Stabilization Technique

NVCA uses a science-based approach involving volunteers and heavy machinery to stabilize banks and improve habitat.

Step 1: Engage

- Engage Landowners
- 96% of the watershed is privately owned, collaboration is essential.
- Build trust, share goals, and identify restoration opportunities and funding.

Nottawasaga Futures
South Simcoe Streams Network Program

"Put a little back"
Nottawasaga River
Ontario, Canada
Nottawasaga Steelheaders

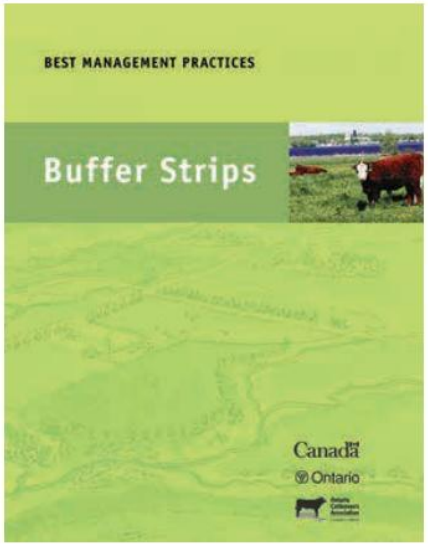
FRIENDS OF MAD RIVER

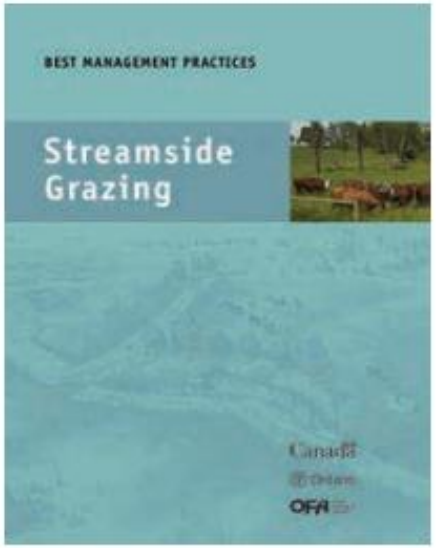
NOTTAWASAGA VALLEY CONSERVATION AUTHORITY

Find collaborators and stakeholders to increase capacity and bring variety of perspectives.

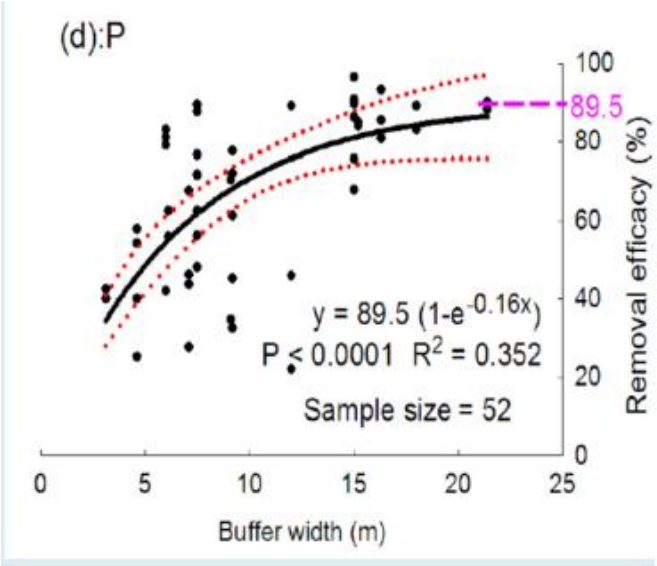
Step 2: Reduce Harm with BMPs

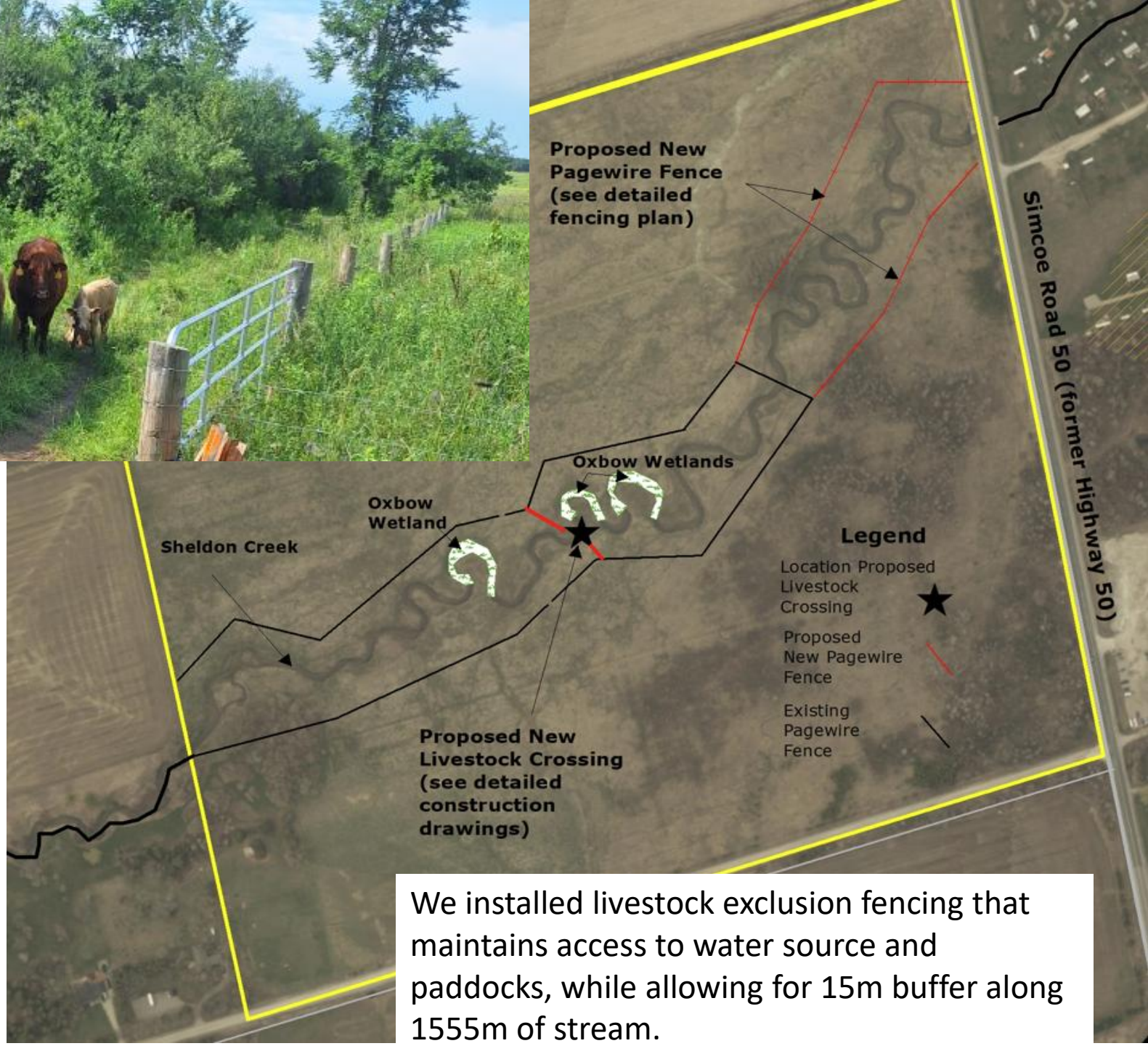
Work <u>with</u> farmers and rural landowners to implement Best Management Practices (BMPs).





Buffers can dramatically reduce phosphorus runoff from pastures and cropland into streams. A 15m wide naturalized buffer reduces ~80% of phosphorus runoff (Zhang, 2009).





We installed livestock exclusion fencing that maintains access to water source and paddocks, while allowing for 15m buffer along 1555m of stream.

Is protection enough?

Non-native pasture grasses with shallow root systems cannot hold the >1m tall banks.

Bare loamy soil can erode at 10N/m^2

- If you remove these threats, will the ecosystem stabilize itself?
- Can the endangered species wait >50 years?

June 2025, Sheldon Creek

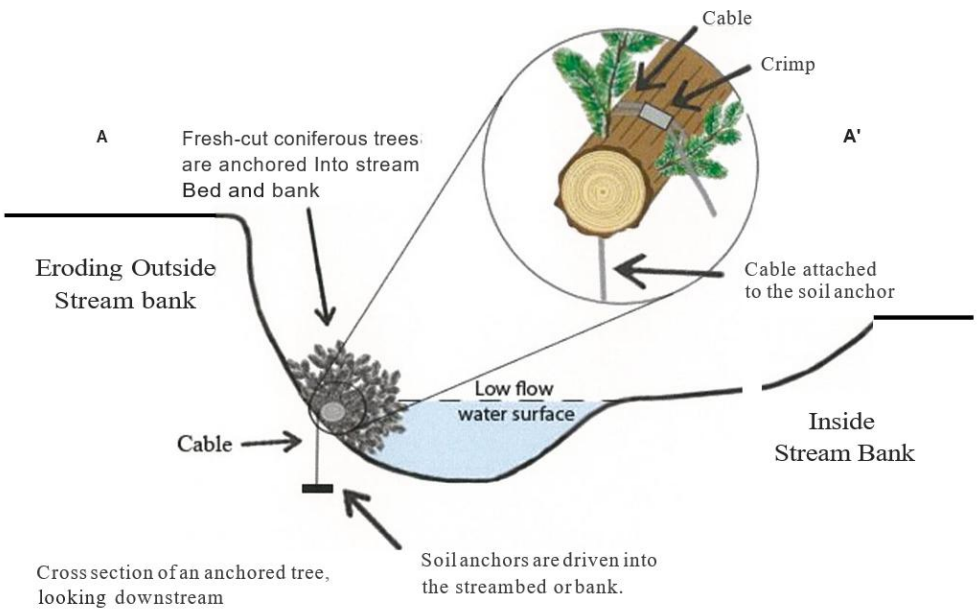
Intervention to create stable abiotic conditions so the biotic can thrive

Terraced, stable banks which will be planted with native shrubs.

July 2025

Step 3:Stabilize

Volunteers use soil anchors to secure recycled Christmas trees to the bottom of the eroding bank to control



Help the river from within the river!
Join us on volunteer workdays in July!

The spaces between the branches and roots offer habitat for small fish and attachment points for filter feeding insects

Volunteer Revetments

These events encourage volunteer and stakeholder engagement.

They are a popular way for anglers, students and conservation enthusiasts to participate in restoration.

Step 3. Reshape

Heavy Machinery adds Woody Cover and Creates Terraced Shelf

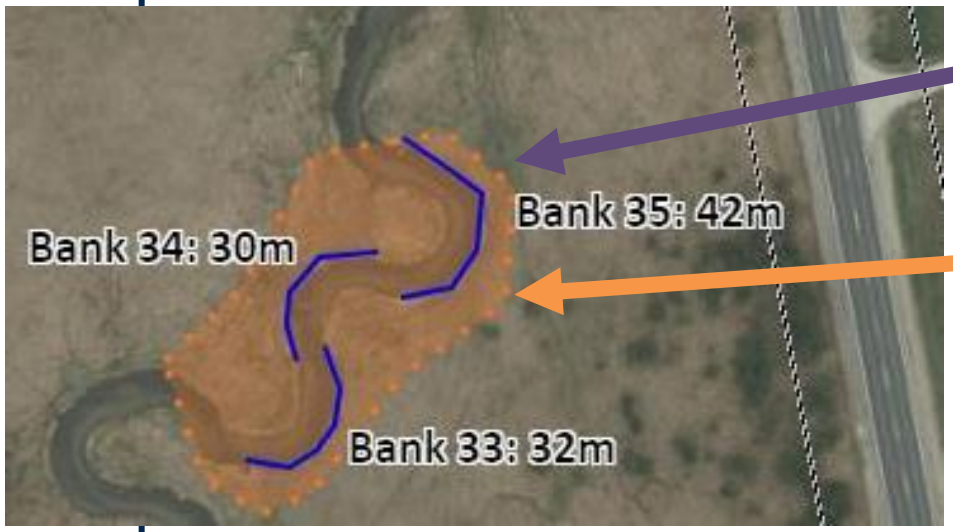
Professionals reshape the eroding bank to create a terraced shelf, that will allow native vegetation to stabilize with its roots.

On larger rivers, like the Nottawasaga River, the excavator inserts logs and tree roots attached to 3m long footer logs into the eroding bank.

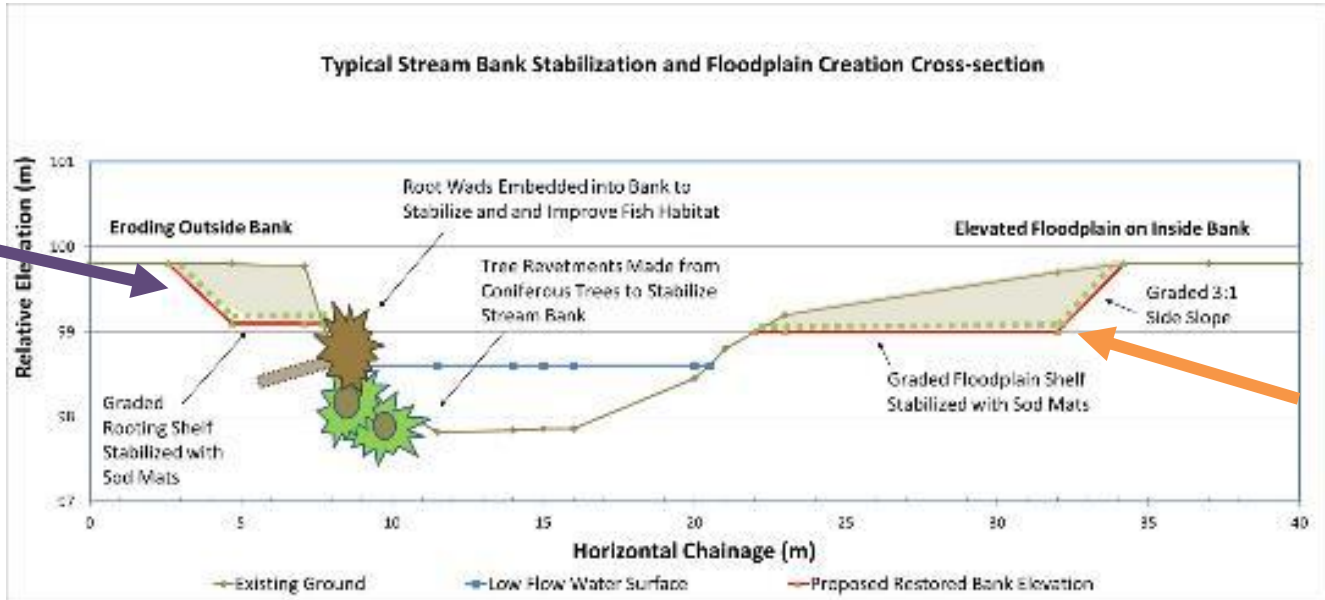
Nottawasaga River, 2022

This provides a rooting shelf for native vegetation to stabilize the bank long term.

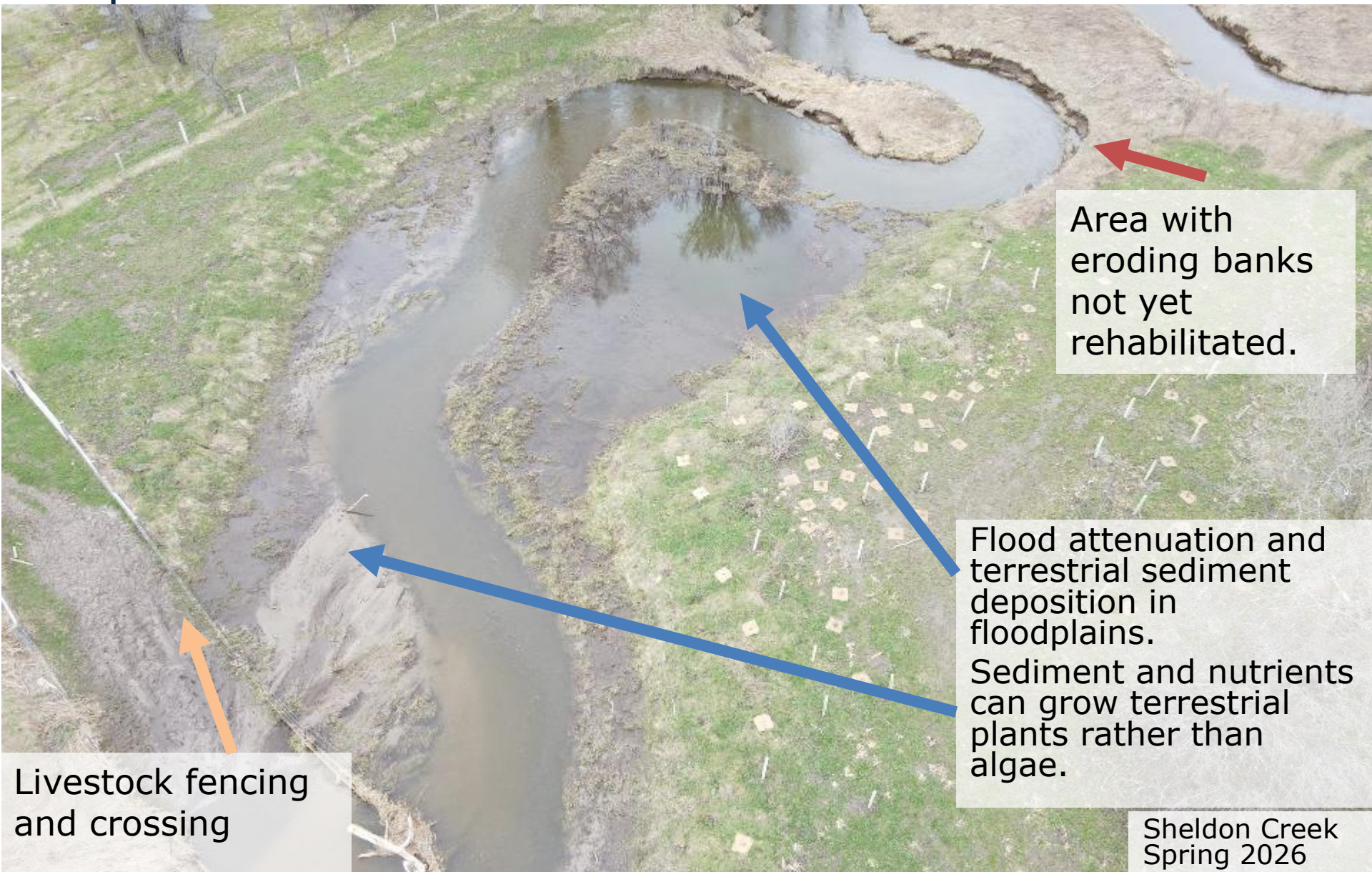
Reshaping and Reconnecting Floodplain



- The excavator doesn't stop after terracing the outer eroding banks
- The terraced floodplain shelves give the river space to flood, rather than keeping the water confined within the channel.

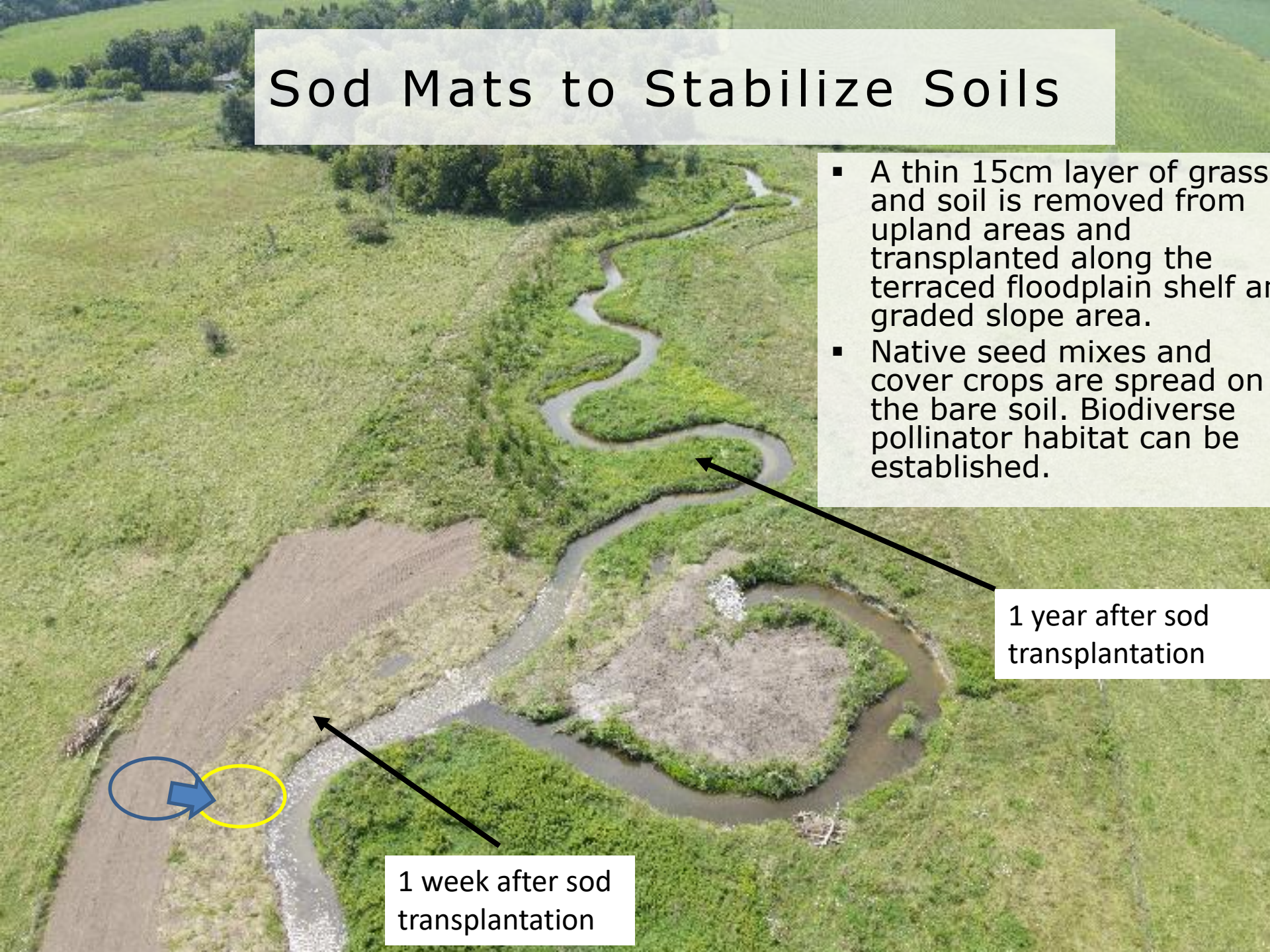


Floodplains in Action



Sod Mats to Stabilize Soils

- A thin 15cm layer of grass and soil is removed from upland areas and transplanted along the terraced floodplain shelf ar graded slope area.
- Native seed mixes and cover crops are spread on the bare soil. Biodiverse pollinator habitat can be established.



Wetland Pockets

Incorporating wetland pockets within floodplain shelves to diversity plant habitat and provide space for amphibians

Oxbow Wetlands and Channel Realignments

Volunteers plant native wetland plants in oxbow and floodplain wetland.

Step 5: Volunteer Tree Plant

Volunteers return to plant native trees, shrubs, wetland plants and wildflowers.

This rebuilds riparian forest, filters runoff and provides shade and habitat.

Step 1: Engage

- Build partnerships and collaboration

Step 2: Protect

- Livestock exclusion fencing

Step 3: Stabilize

- Woody Bank Protection

Step 4: Reshape

- Excavator creates terraced shelves
- Reconnects river to floodplains
- Create oxbow wetlands

Step 5: Replant

- Volunteer Replant & Seed

- 4.6 km stabilized
- ~1 ha wetland created
- Thousands of native trees planted
- 2.5 km river excluded form livestock access

Natural channels provide:

- Flood attenuation
- Sediment management
- Water quality treatment
- Climate adaptation
- Sequestered Carbon
- Supporting Biodiversity and Agricultural Resilience

Natural channels and floodplains and wetland are green infrastructure.

When we restore rivers, we are investing in resilient landscapes that protect communities, support agriculture, and improve ecological function.

Thank you to our Funders

Nottawasaga River Restoration Program

Nottawasaga Valley Conservation Authority

Nottawasaga Futures
South Simcoe Streams Network Program

Fisheries and Oceans Canada / Pêches et Océans Canada

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Planting trees and stabilizing riverbanks
to improve water quality and fish habitat

For more information or to donate: (705) 424-1479 nvca.on.ca

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Priority Restoration Areas

Recent Restoration Projects

Projects with 2026-27 Phases

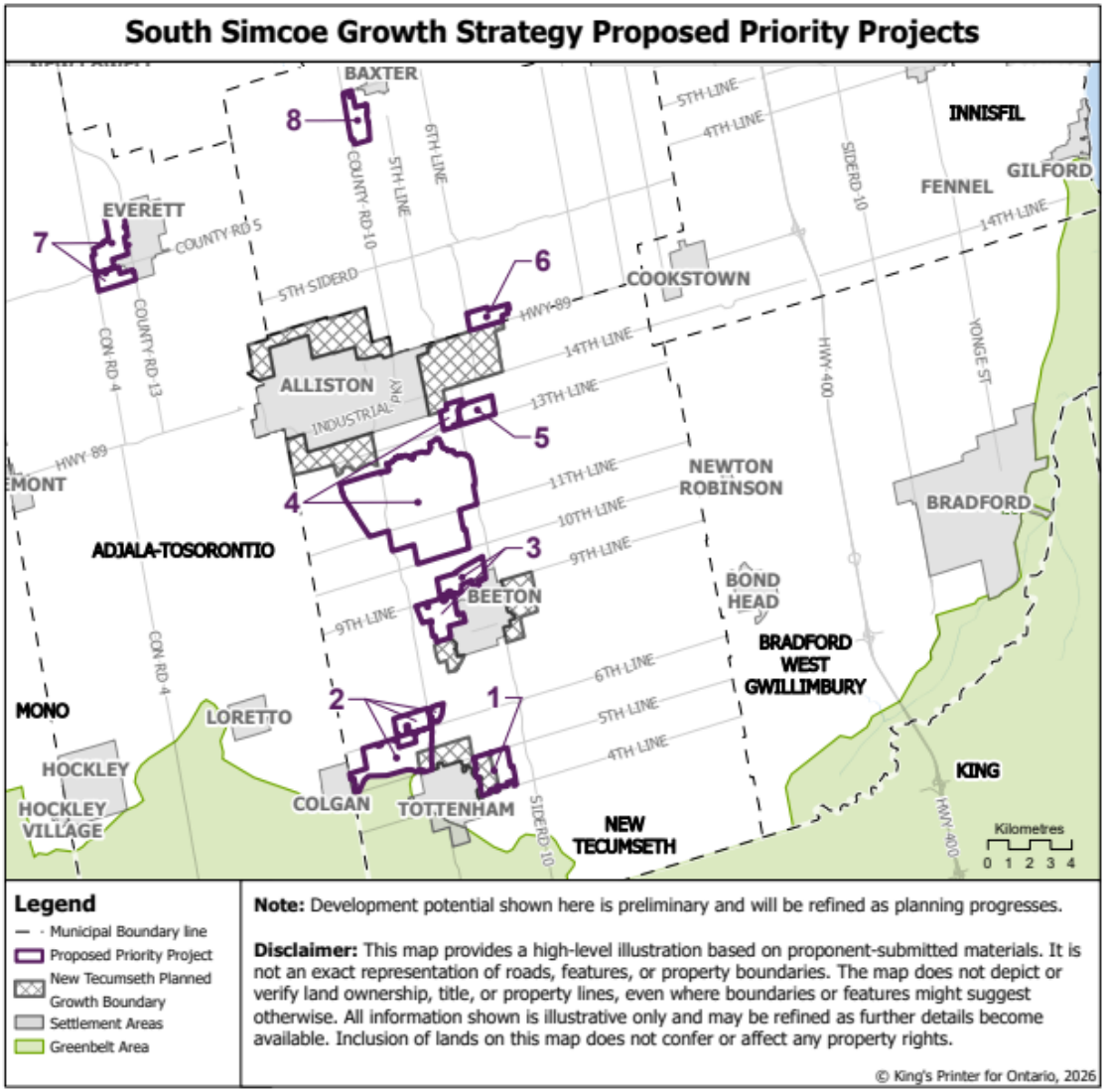
Goal: 10km of river restoration in 10 years.

Future Developable Areas in South Simcoe County

Can investing in natural infrastructure,

including floodplain wetlands, stable streambanks and riparian forest,

help offset impacts of proposed rapid development?



Lessons Learned

Lesson 1

» Landowner relationships and recruiting funding take longer than engineering design.

Lesson 2

» Building projects in phases has benefits!
  – Funding flexibility
  – Adaptive management

Lesson 3

» Volunteers add value even on large construction projects.

Lesson 4

» Floodplain reconnection often provides greater long-term benefit than bank armouring alone.

Lesson 5

» Historic degradation took decades, it cannot be repaired overnight

Volunteer for stewardship events and restoration project tours:

www.NVCA.on.ca/events

Thank-you

Laura Wensink, BSc, Certified Ecological Restoration Practitioner, River Restoration Technician

705-424-1479 ext 275

lwensink@nvca.on.ca