REACH BASED RESTORATION :

SUCCESSES AND LESSONS LEARNED FROM DECADES OF ECOLOGICAL RESTORATION

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Presentation Outline

- Prioritizing Urban Stream Restoration Projects
- Past and Current Design Techniques
- Identifying Suitable Sites for Natural Channel Restoration
- Feature Project Example: Alfred Khuene Natural Channel Project
- Other Project Examples
- Results

Prioritizing Urban Stream Restoration Projects

Problem:

Multiple channelized/hardened urban stream systems requiring maintenance throughout TRCA jurisdiction

Solution:

Identify and prioritize impaired systems can be restored using natural channel design/principles

Restoration Challenges in an Urban System (end of the pipe)

- Hardened stream features, degrade over time (limited lifespan)
- Not connected to floodplains/incised creek channel
- Uncontrolled storm water inputs
- Lack of vegetation and impervious surfaces
- Flood prone areas and lack of flood storage
- Poor habitat quality
- Poor water quality

Past Design Techniques

- Past focused on fixing end-of-pipe (e.g. erosion) rather than system fixes or reach base restoration
- Spot fixes rather than reach based solutions
- No consideration of upstream and downstream issues (i.e. transferring the root problem)
- Lack of incorporating critical habitat components into designs
- Heavy focus on armouring in areas where a softer approach would be more beneficial

Current Design Techniques

- Dealing with all aspects of the impairment/features not just the impact
- System based approach
- Reconnecting to floodplain
- Reconstructing low flow channel to convey proper flows
- Wetlands and other associated habitat in the floodplain
- Natural cover and soil stability
- Wetlands at storm outlets for water quality
- Floodplain roughness and direction within entire width of floodplain using woody debris, rocks, plantings
- Structural habitat: in-stream and in the floodplain (riffle:pool, bank habitat/protection
- Incorporating storm water treatment and green infrastructure

Identifying Suitable Sites for Natural Channel Restoration

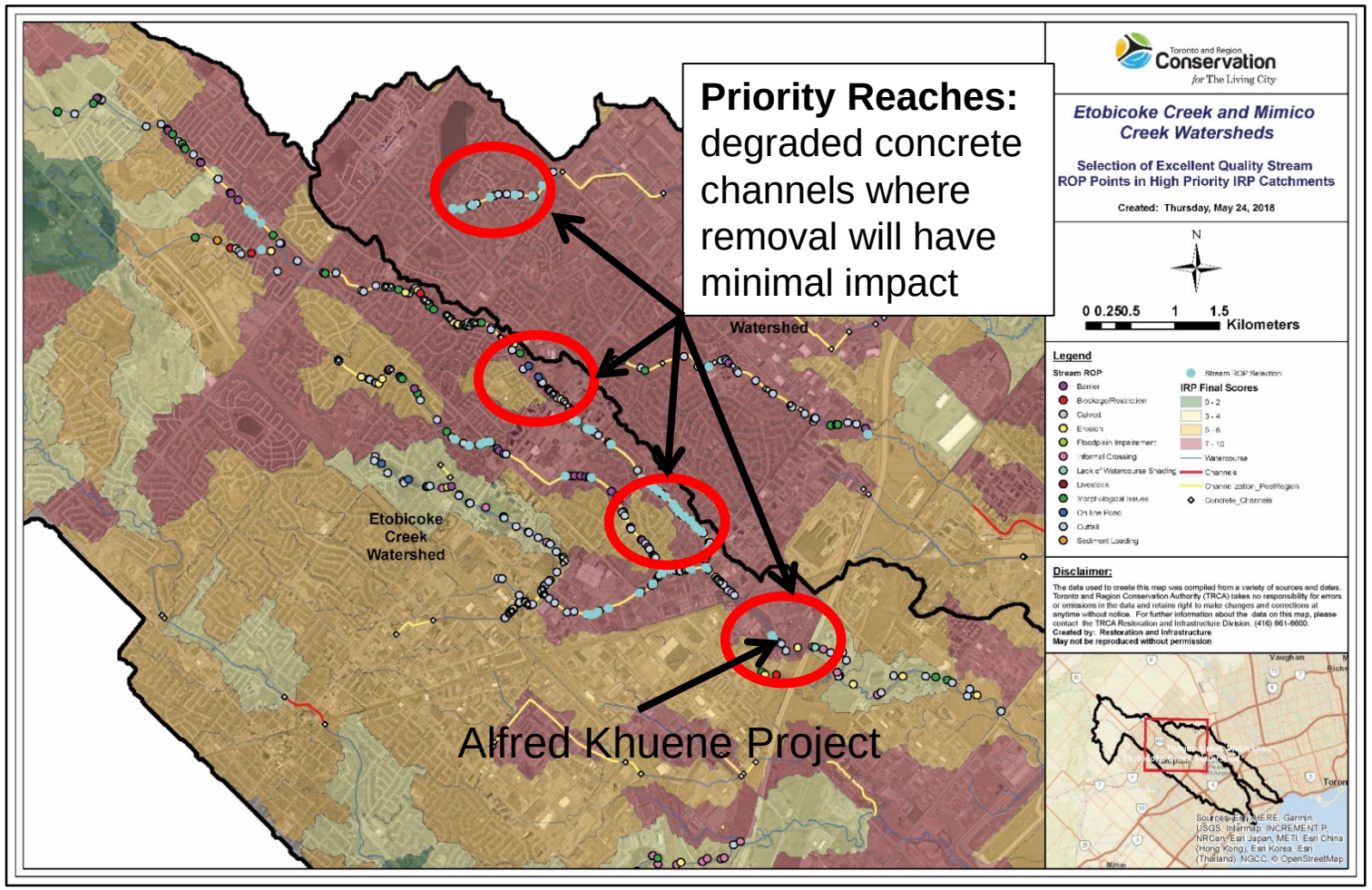
Site Selection based on:

- IRP and ROP Information
- Flood constraints/opportunities
- Adjacent property and infrastructure constraints/opportunities
- Access constraints/opportunities

Prioritization based on:

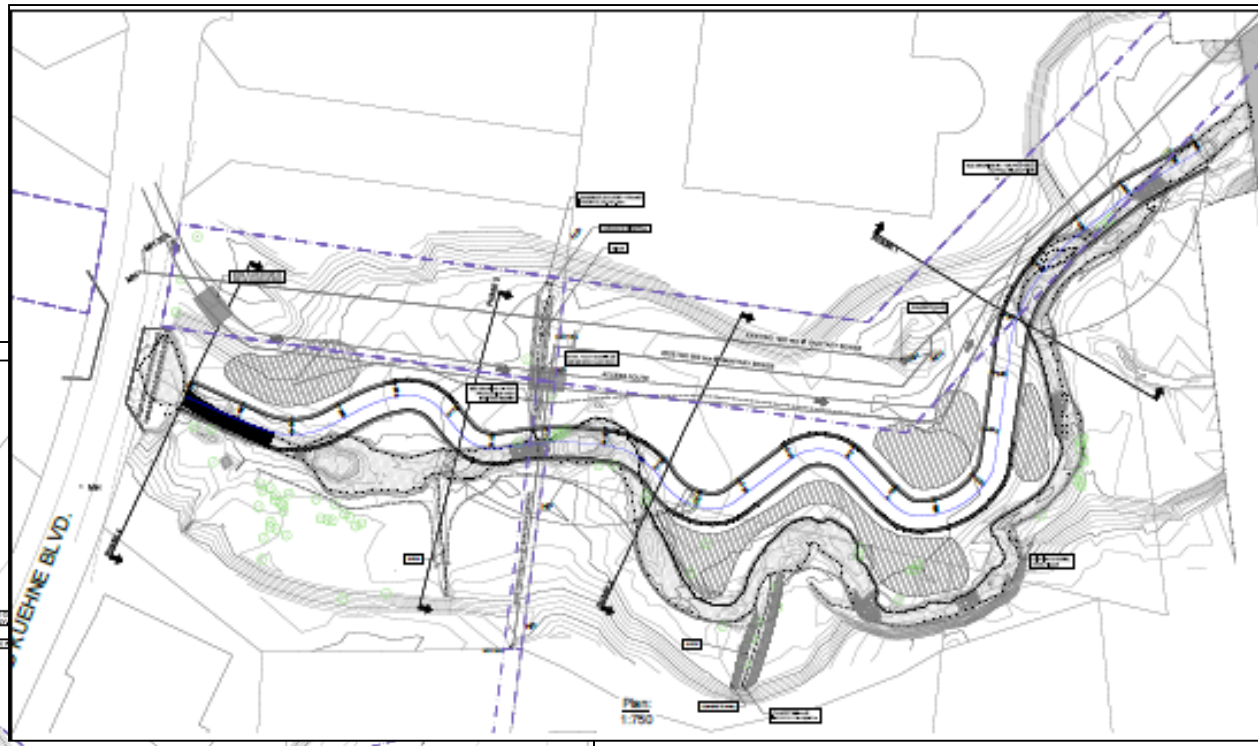
- Condition of existing channel (e.g., failed vs. failing concrete)
- Potential for largest habitat gains over current conditions (i.e., going from concrete lined to natural channel with floodplain connectivity and habitat features)
- Proximity to existing habitat to facilitate integrated habitat function (i.e., Connectivity, invertebrates, fish and wildlife)

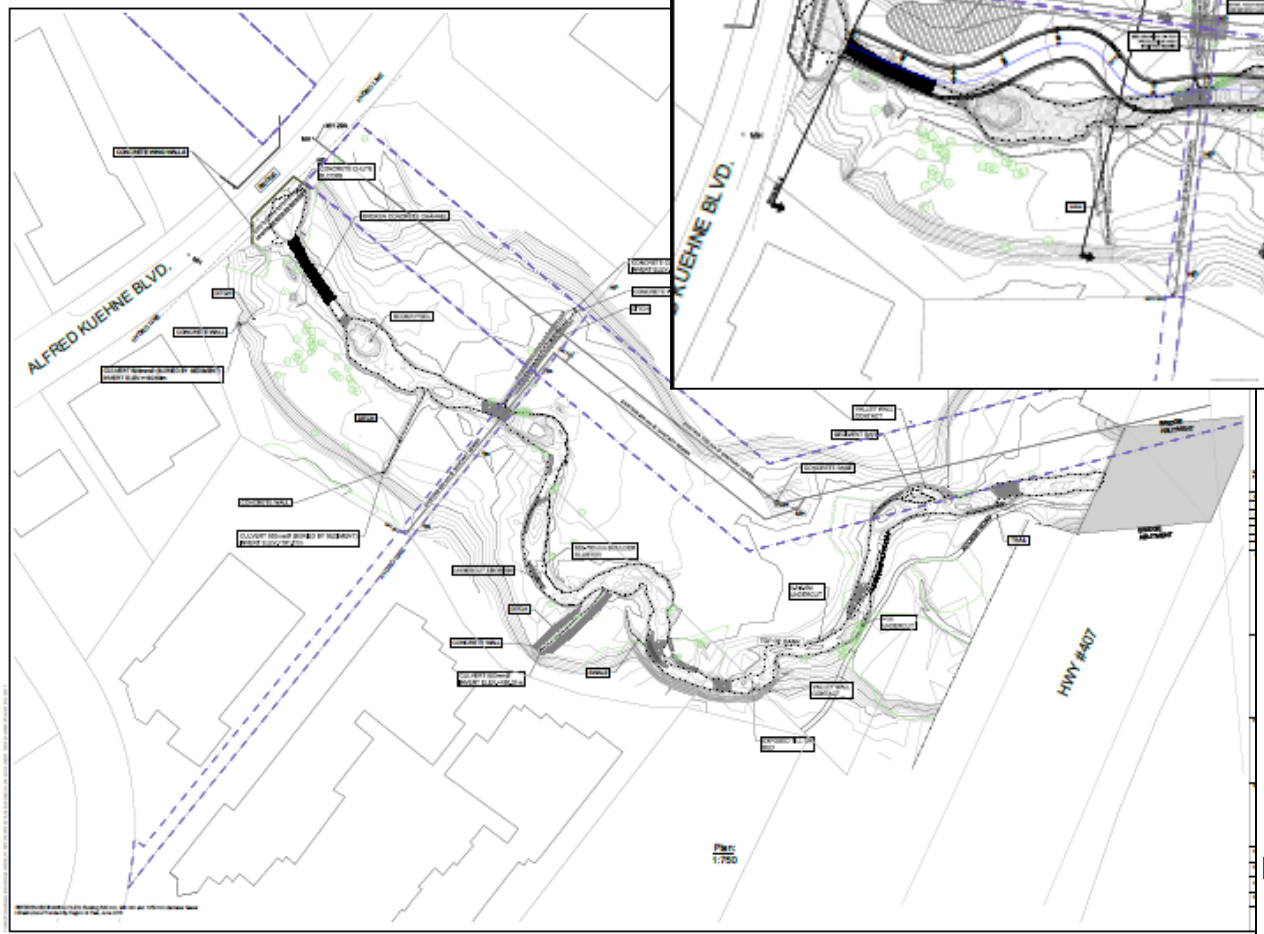
Prioritizing and Site Selection: Spring Creek Reach Mapping



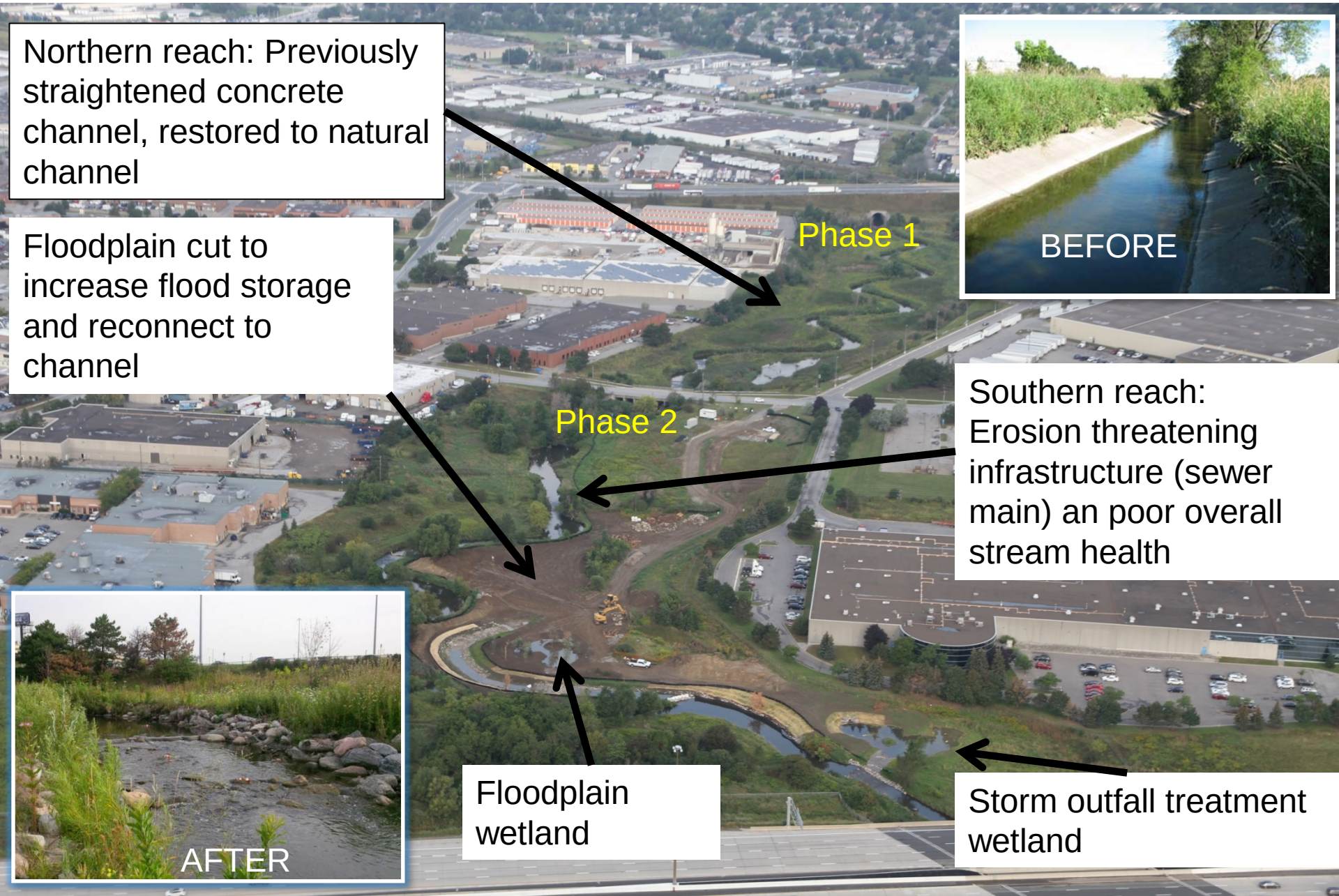
Feature Project: Spring Creek (Alfred Kuehne) Phase 1

Feature Project: Spring Creek (Alfred Kuehne) Phase 2





Feature Project: Spring Creek (Alfred Kuehne)



Feature Project: Spring Creek (Alfred Kuehne)

BEFORE

AFTER

Use of Woody Material

- Replaces structure loss from clearcutting
- Provides habitat for wildlife
- Can be used for bank protection
- Provides important fish habitat
- Increases surface roughness

Use of Stone Material

- Critical bank projection
- Fish habitat (riffle:pool)
- Hard features control flows (vortex weirs)
- Other floodplain habitat

Use of Vegetation (Bio-engineering)

- Soil stabilization
- Bank Protection
- Overhanging vegetation for food and cover
- Alternative to hardened surfaces

Wetlands and Floodplain Storage

- Increased flood capacity
- Reconnects channel to floodplain
- Provides habitat for wildlife using valley corridor
- Water quality treatment when intercepting uncontrolled storm flow

Other things to consider During Construction (Weather)

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Other Project Examples

Humber Estuary Hooks (Coastal)

Before

Hardened Bank with no habitat structure

After

In water habitat added with bank protection

Heart Lake Shoreline

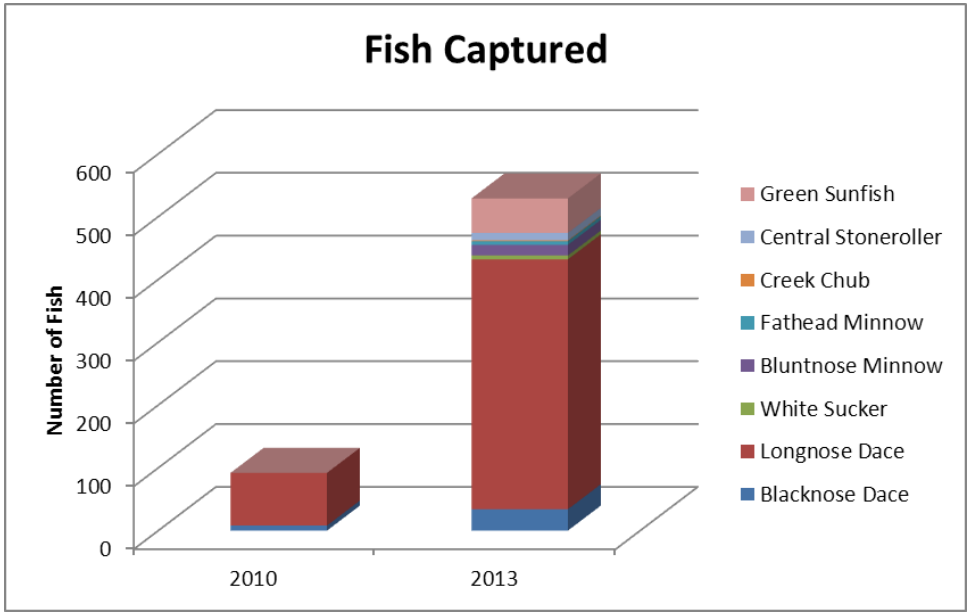
Before

Degraded Shoreline with failed gabion baskets

After

Restored Shoreline with habitat features, trail, and fishing node

Restoration Success



	2010	2013
Blacknose Dace	8	34
Longnose Dace	84	398
White Sucker	0	6
Bluntnose Minnow	0	17
Fathead Minnow	0	6
Creek Chub	0	1
Central Stoneroller	0	12
Green Sunfish	0	55
TOTAL	92	529

2010 Pre-restoration: 92 fish were sampled. Only 2 species

2013 Post restoration: 529 fish were sampled. 8 species

Thank You!

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Before


During


After

Prioritizing Urban Stream Restoration Projects

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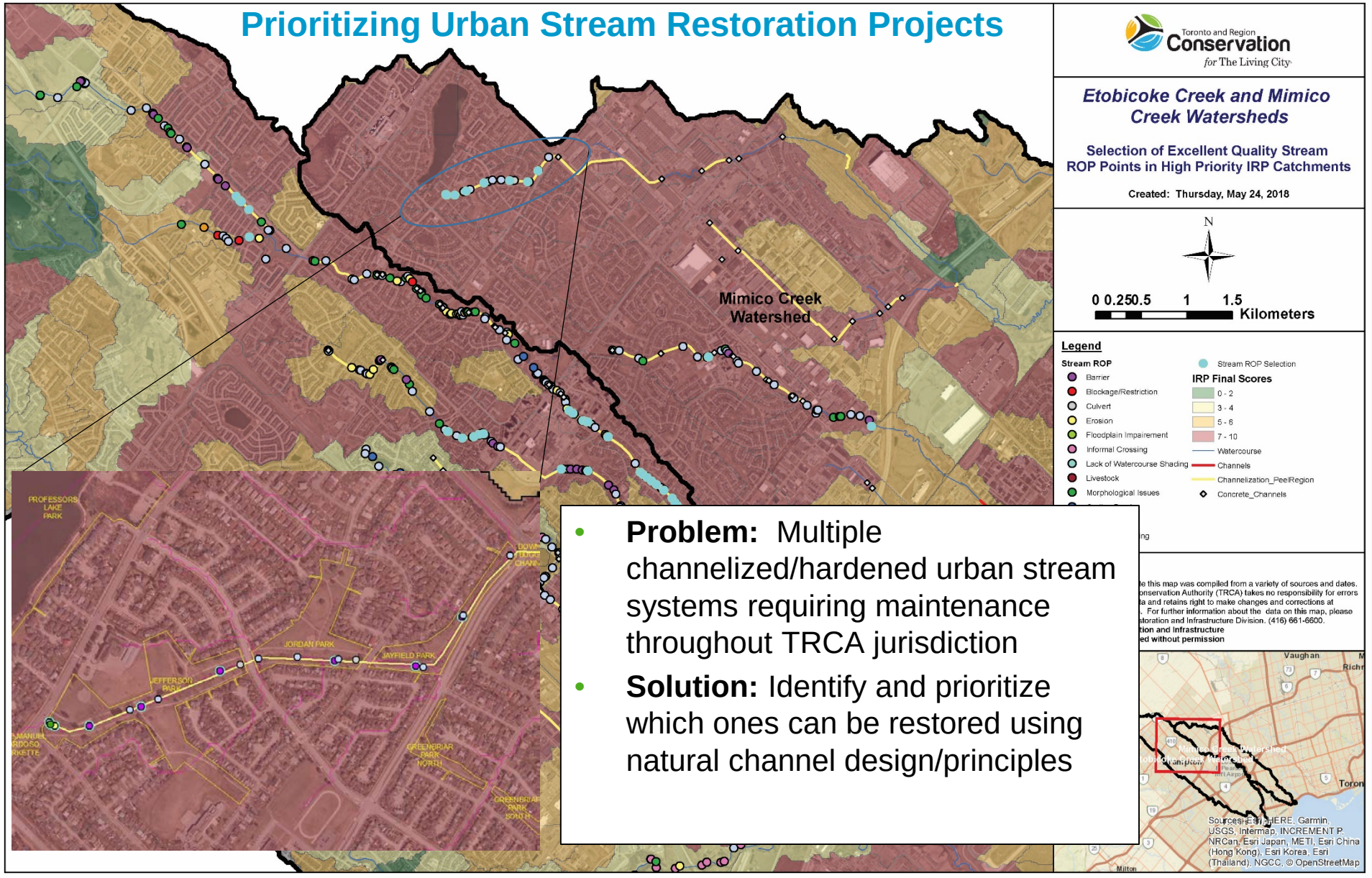
Solution: Identify and prioritize which ones can be restored using natural channel design/principles

Prioritizing Urban Stream Restoration Projects



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Identifying Suitable Sites for Natural Channel Restoration

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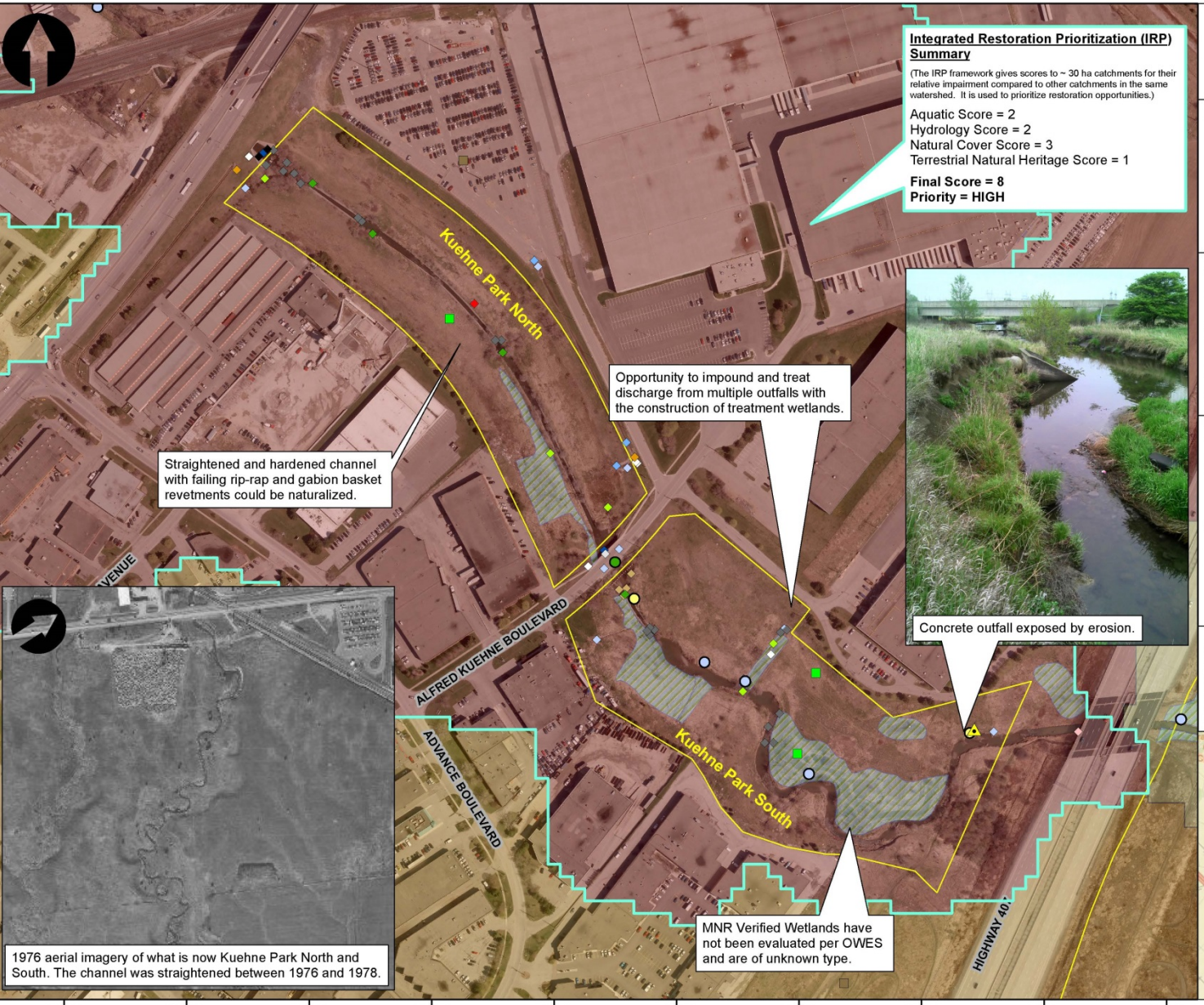
Application:

- Utilize naturalized channels to satisfy Fisheries Act requirements
- Develop proponent led habitat banking (creating fish habitat where there was none)

Alfred Kuehne Stream Restoration Project



Toronto and Region Conservation for The Living City

City of Brampton Parks:

Kuehne Park North and Kuehne Park South

Restoration Opportunities

Spring Creek Subwatershed, Etobicoke Watershed

Notes:

- Straightened channel does not allow for dispersal of energy, adequate deposition of sediment, or interaction with the groundwater table. Straightening has effects downstream.
- Straightened channel provides poor habitat.
- Channel is characterized by major erosion, failed revetments, and exposed infrastructure.
- Multiple road outfalls discharge into the valley.
- Habitat: Intermediate Riverine Warmwater
- MGMT Zone: Darter Species
- Snell Approach identified the area as a historic wetland lost before 1967.

Legend

EP Erosion Hazards

RP Stream ROP
Erosion
Morphological Issues
Outfall

RP Terrestrial ROP
Forest
Riparian

EP Erosion Control Structures
Bridge
Catch Basin
Channel(ized)
Culvert
Drainage Pipe
Drainage Swale
Manhole
Outfall
Retaining Wall
Revetment
Sanitary Crossing
Water Main
Weir

Wetlands_mnr

Brampton_Parks
Brampton_Parks

IRP_final_scores
3 - 4
5 - 6
7 - 10

Disclaimer:
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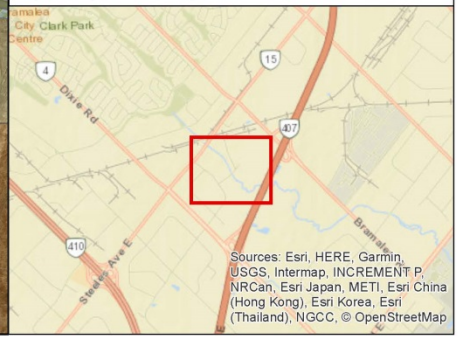

Spring Creek Remediation Project

- Spring Creek Pilot Project report completed in 2014 by TRCA , and
- Fluvial Geomorphological Characterization report completed in 2015 by Dr. Paul Villard and the University of Guelph
- Identified reaches within Spring Creek Watershed suitable for Restoration
- TRCA is currently in the process of prioritizing these sites for a 10 year Restoration Plan
- TRCA in early stages of establishing candidate sites for Proponent-led Habitat Banking

Project

Khuene

- Show video
- Examples of what was included
- Site pics before and after
    - Bank treatments
    - In-water treatments
    - Flood plain wetlands
    - Stormwater treatment wetlands

Deliverables

Length of stream

Area of natural cover

Barrier removals

Wetland cover

Next Steps

10 year plan

“Joel’s slides

Restoration Goals and Objectives

Goal:
Protect and restore ecosystem function and health to benefit ecological goods and services.

Objectives

1. Restore **natural hydrologic processes** and aquatic systems by reversing, repairing or mitigating alterations and impairments
2. Restore and/or **increase natural cover** (wetland, riparian, forest, and meadow)
3. Enhance landforms and **restore soil and soil processes** to promote self-sustaining natural communities
4. Maximize size, shape and **connectivity** of natural heritage features

TITLE?