Temporal changes in terrestrial biota observed through Toronto and Region Conservation Authority's Natural Channel Design Monitoring Program 2-15 years post-restoration

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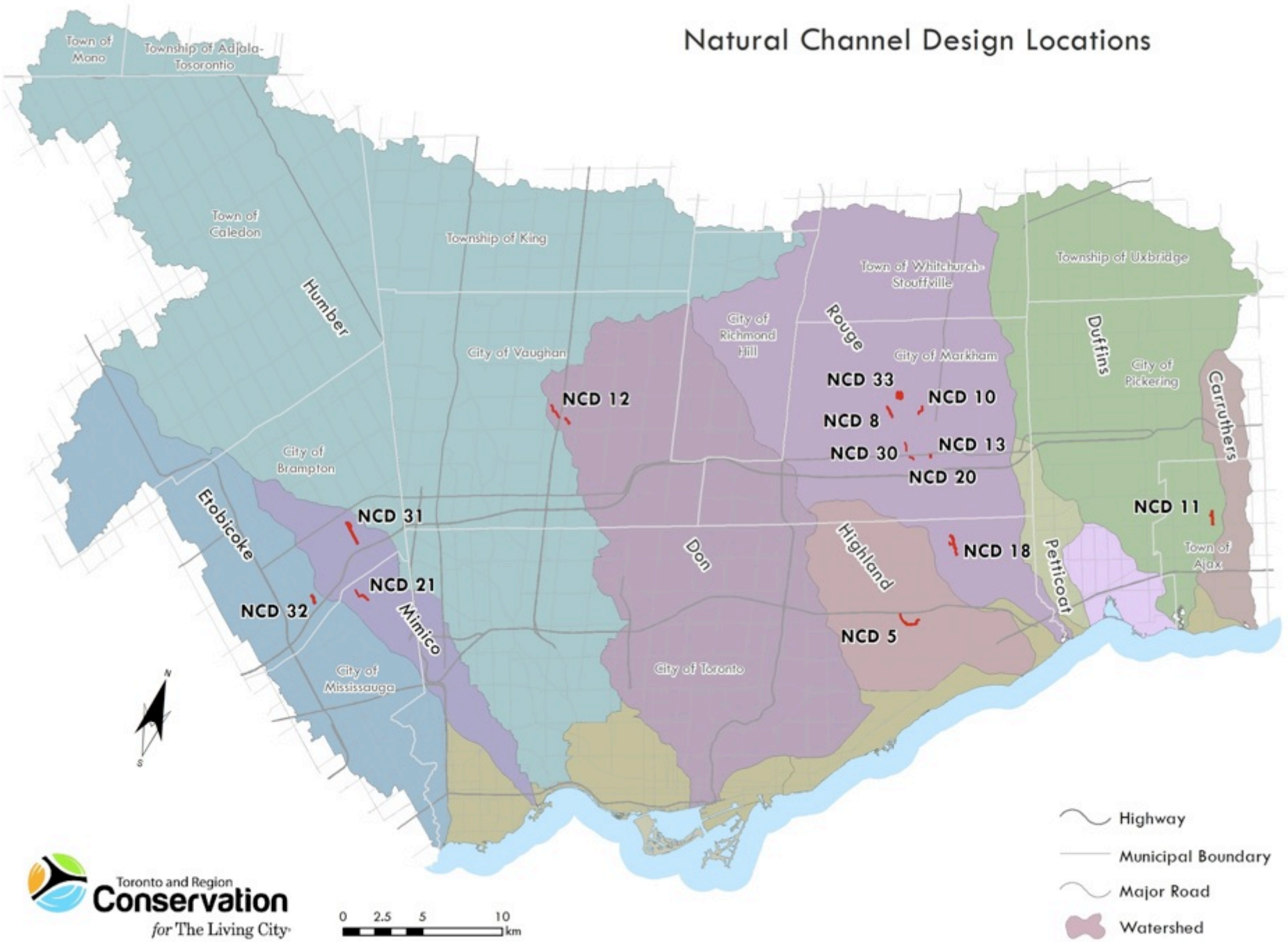
The Living City Foundation | Toronto and Region Conservation for The Living City

TRCA's Natural Channel Design Project

- NCD goals
  - Geomorphic
  - Ecosystem restoration

- Monitoring and evaluating effectiveness
  - Needed to inform decision-making
- **Riparian vegetation** (ELC communities, regional species of concern inventories, invasives)
- **Amphibian and breeding bird surveys**


Natural Channel Design Locations
Town of Mono
Township of Adjala-Tosorontio
Town of Caledon
Township of King
Humber
City of Vaughan
City of Richmond Hill
Rouge
Town of Whitchurch-Stouffville
City of Markham
Township of Uxbridge
Duffins
City of Pickering
Carruthers
Town of Ajax
City of Brampton
Etobicoke
Don
Highland
Petticoat
Mimico
City of Mississauga
City of Toronto
NCD 12
NCD 33
NCD 10
NCD 8
NCD 30
NCD 13
NCD 20
NCD 11
NCD 18
NCD 31
NCD 21
NCD 32
NCD 5
N
S
Toronto and Region Conservation
for The Living City
0 2.5 5 10 km
Highway
Municipal Boundary
Major Road
Watershed

Objectives

- Describe terrestrial monitoring methods implemented and provide recommendations for improvement

- Identify temporal changes in:
  - Vegetation communities (wetland, meadow, aquatic)
  - % native flora species
  - Degree of exotic invasion
  - Avian habitat use
  - Frog species richness

- Explore Species-area Relationships

Monitoring Methods

- Terrestrial Field Data Collection Protocol (TRCA 2011)
  - Flora, vegetation communities, breeding birds, amphibians
  - Incidentals

- Scoring and Ranking System
  - Not just species richness
  - Local occurrence (rarity), area-sensitivity, sensitivity to development, population trends, habitat dependence

Scoring and Ranking System

Rank	Fauna	Flora	ELC community
L1	Most sensitive, rare	Most sensitive, rare	Rare, stringent habitat needs
L2			
L3			
L4			
L5	Least sensitive, common	Least sensitive, common	Common
L+	Non-native	Non-native	Community defined by non-native species

Scoring and Ranking System

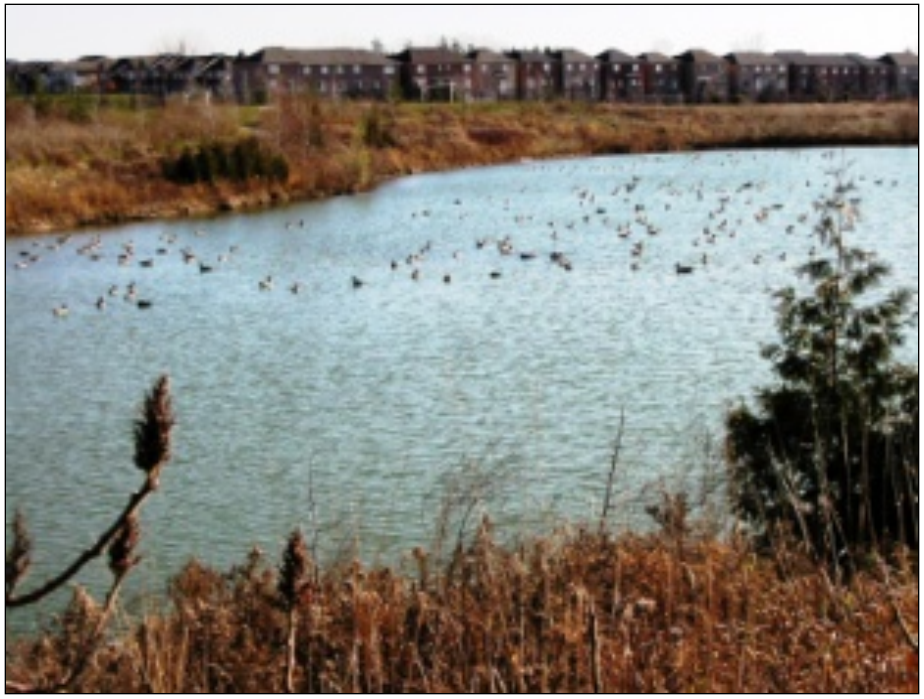
Rank	Fauna	Flora	ELC community
L1	Regional Conservation Concern – Restricted occurrence		
L2			
L3			
L4	Urban Conservation Concern – Secure in rural only		
L5	Generally secure		
L+			

Vegetation Communities and Flora

- Flora species and vegetation communities were surveyed concurrently from May until October – twice over ~15 years
- Ecological Land Classification (ELC) protocol for Southern Ontario
  - Novel application
- Six main categories of natural cover: forest, successional, dynamic, meadow, wetland, and aquatic (used for statistical analysis)
- Flora of concern mapped (L1-L4)
- Invasive species monitoring (points or level of disturbance within a polygon)

Breeding Bird Surveys

- Breeding bird surveys were conducted during a 6-8 week period between late May and mid-July
- Sites were visited twice during the breeding season
- *Spot-mapping*
- Surveyed at approximately 5-year intervals



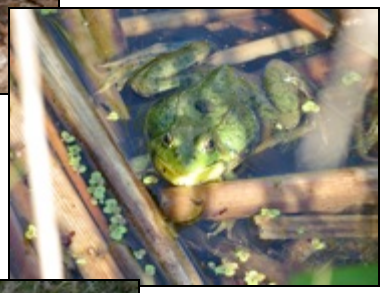
Amphibians

- Loosely based on Marsh Monitoring Program although no formal time limit or radius used

- Three surveys (based on date and overnight temperatures)
- Each of these surveys was separated by at least 15 days

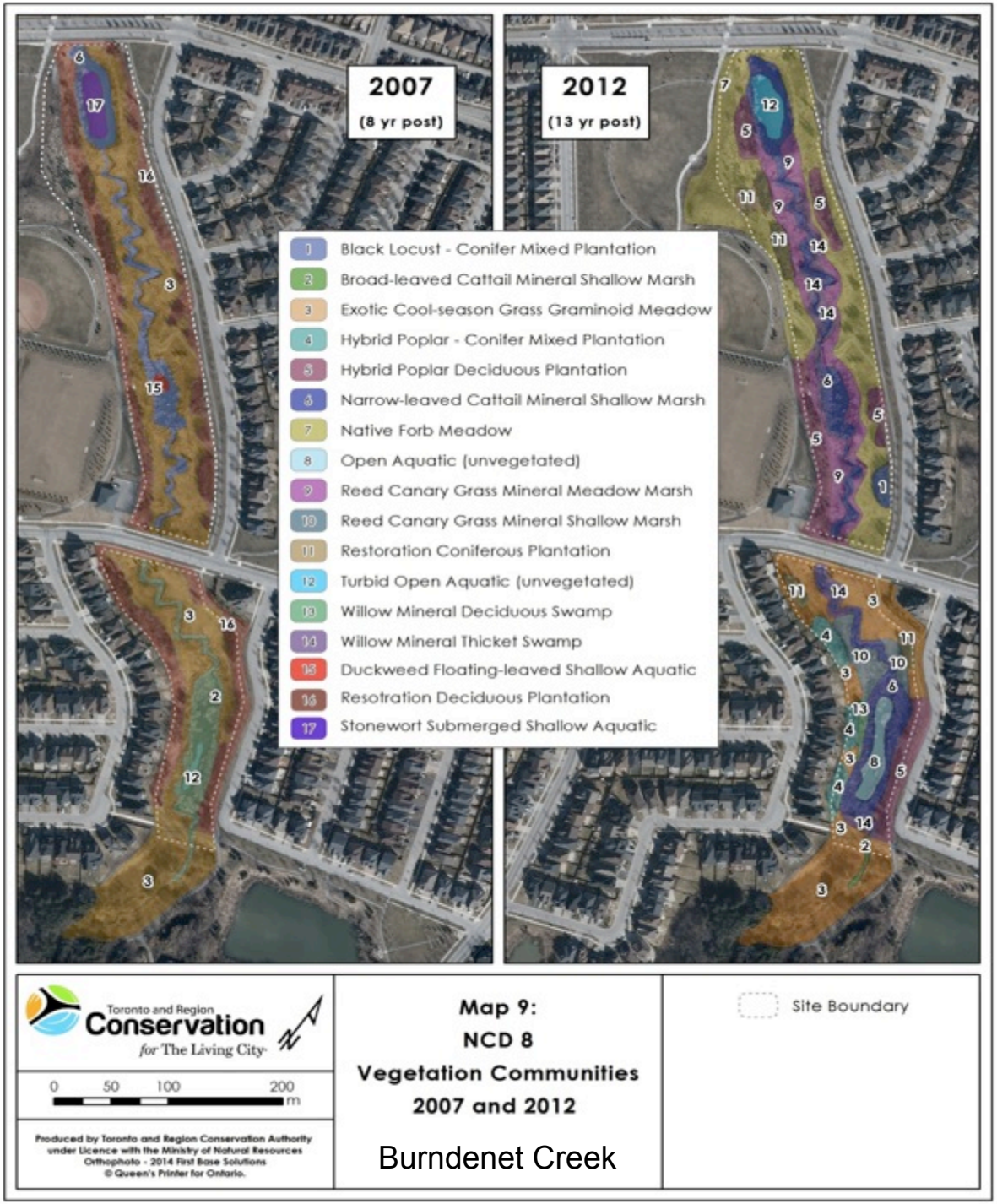
- *Incidental species were also recorded (reptiles, mammals)

- Surveyed at approximately 5 year intervals



Results

- Site-specific
- Complex
  - To view the full report please contact: dyoung@trca.on.ca
- Pooled for analysis and discussion

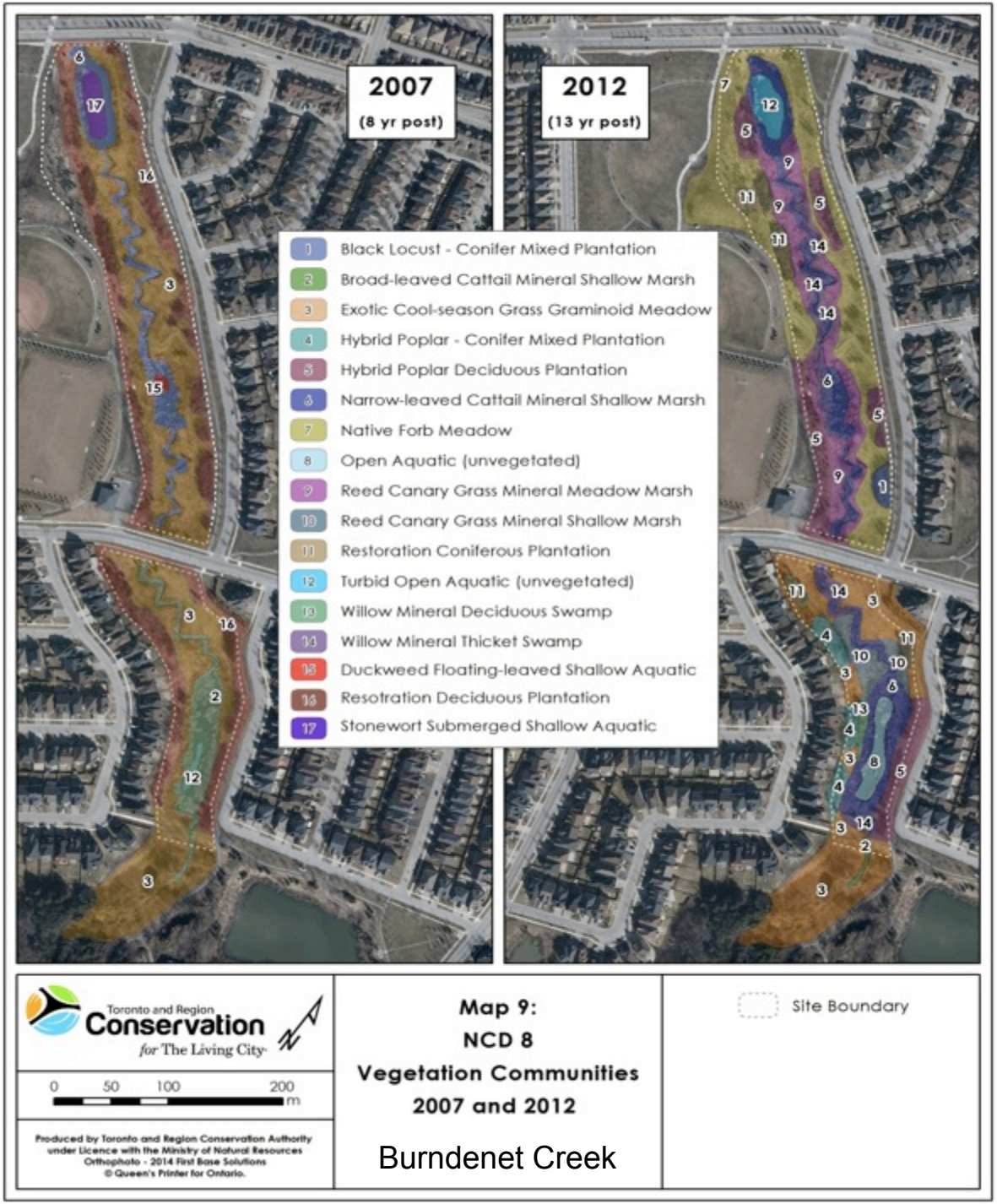


Note

- One of the goals of the NCD project related to terrestrial flora and fauna was to create a riparian corridor with native and diverse vegetation that supports terrestrial habitat equivalent to that of undisturbed streams
- Concurrently monitor the NCD sites along with several natural riparian corridors and un-restored stream channels in urban areas
- This would have allowed a direct comparison among unrestored, restored and natural riparian corridors in an urban landscape
- Using a standardized survey protocol (time and space) as this would eliminate site size effects

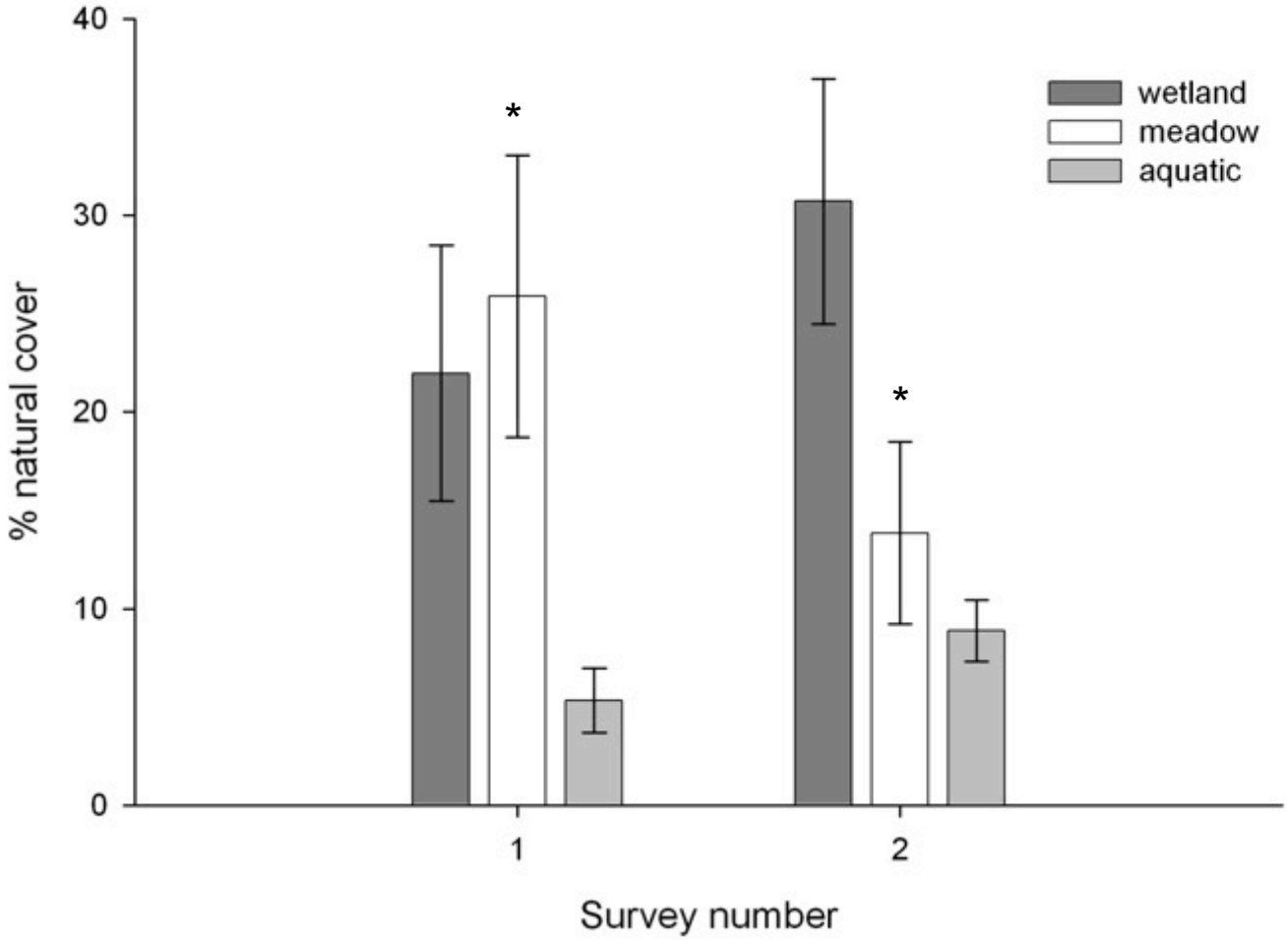
Results: Natural Cover Type

- Each ELC community can be grouped into categories of natural cover types (e.g. Native Forb Meadow and Exotic Cool-season Grass Graminoid Meadow = Meadow)
- Compared between surveys



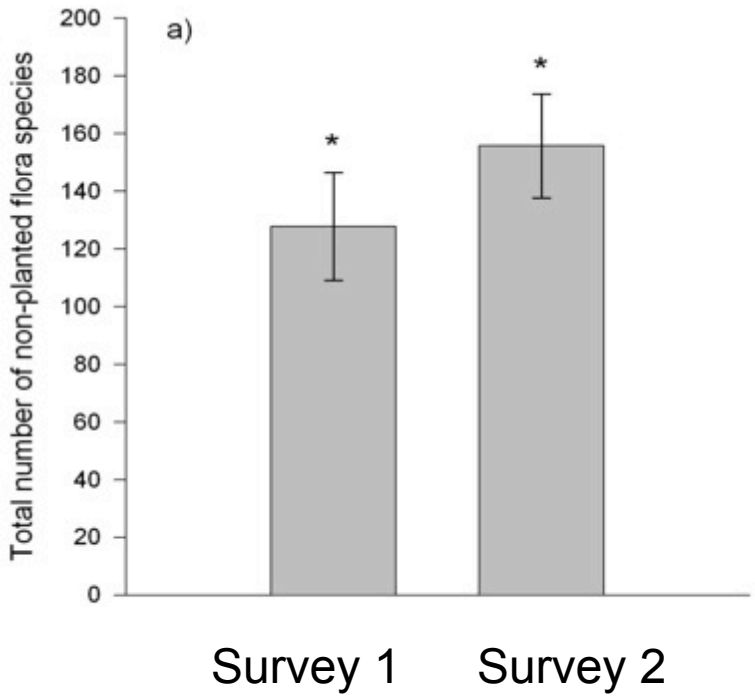
Results – Natural Cover Type

- Altered channel design
- Beaver

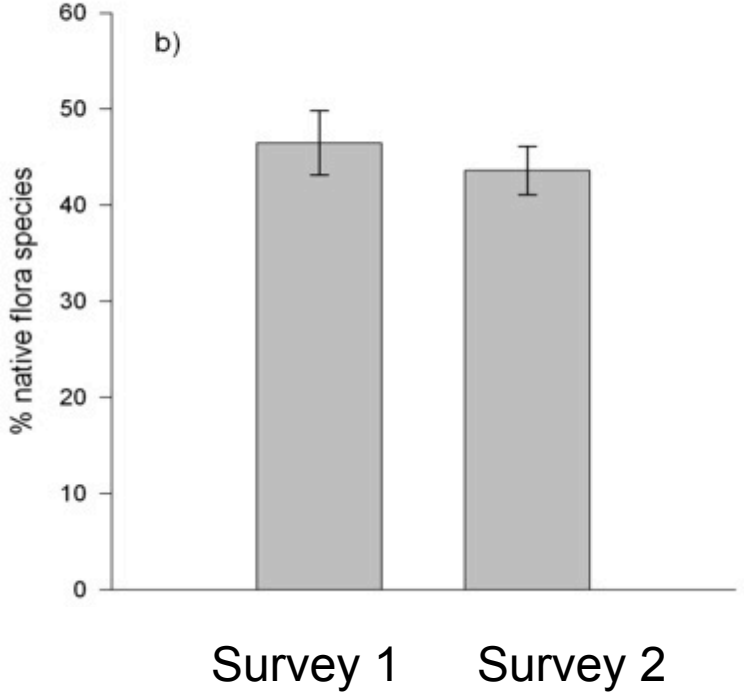


Results – Flora Species

non-planted



% native



- Colonization, more wetland opportunity, further established so identification possible

Plantings

- Plantings were a major component of the flora at NCD sites
  - An array of native upland and wetland species

- Generalist trees and shrubs are doing well such as staghorn sumac (*Rhus typhina*), basswood (*Tilia americana*), cedar (*Thuja occidentalis*) and dogwoods (*Cornus* spp.)

- Long-term survival of coniferous species questionable
  - Slow-growing and may not be able to compete with invasive species or fast-growing deciduous species
  - Plant conifers more densely and increase maintenance efforts early on to give these species a chance for survival

Plantings

- Wetland and prairie planting survival
  - Competition with invasives (esp. wetland plantings)
  - Improper environmental conditions (prairie plantings needing sandy soils)

- Check for proper labelling of nursery stock
  - E.g. Oriental bittersweet (*Celastrus orbiculatus)* likely mislabelled as the native American bittersweet (*C. scandens*)

Exotic Flora Species

- On average, 57% of non-planted flora species were exotic
- No change temporally in the % exotic species

Toronto and Region Conservation for The Living City

0 50 100 200 m

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Map 64:
NCD 21
Select Invasive Species
2014

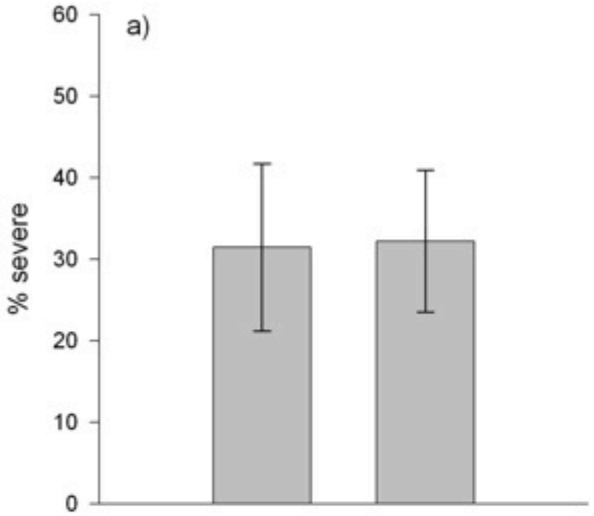
- Common Buckthorn
- Common Reed
- Dog-Strangling Vine
- European Alder
- Garlic Mustard
- Manitoba Maple
- Oriental Bittersweet
- Shrub Honeysuckle

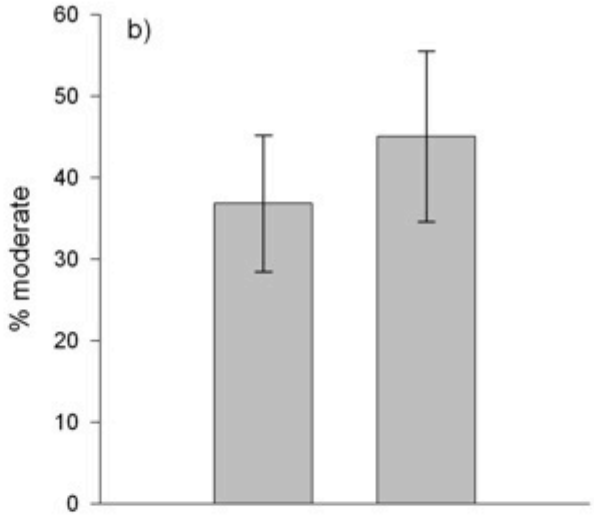
Exotic Disturbance

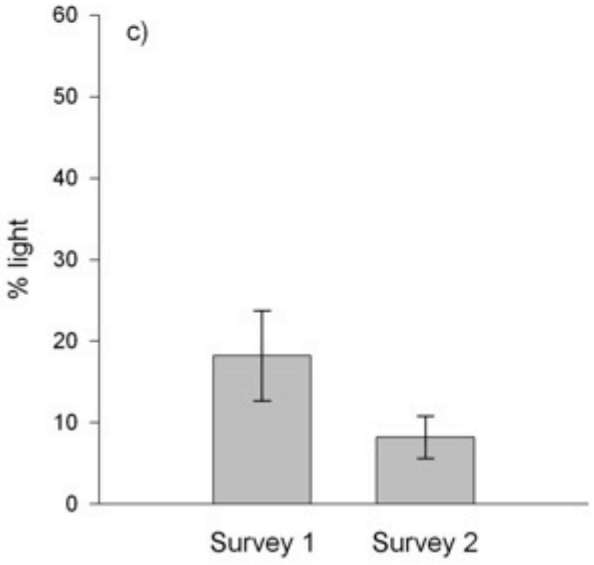
- In each ELC polygon
- Subjective, yet informed, measurement
- 3 assessment criteria
  - Dominance
  - More/less virulent
  - Prospect for succession

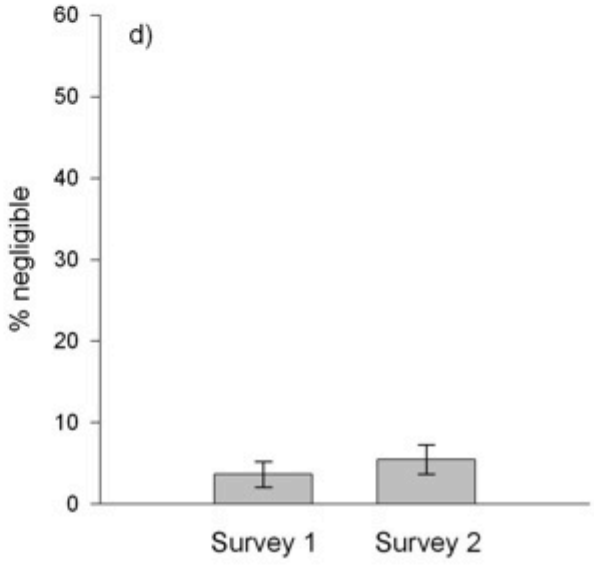
Exotic Disturbance

- No temporal change
- Most communities are either moderately or severely affected by exotics



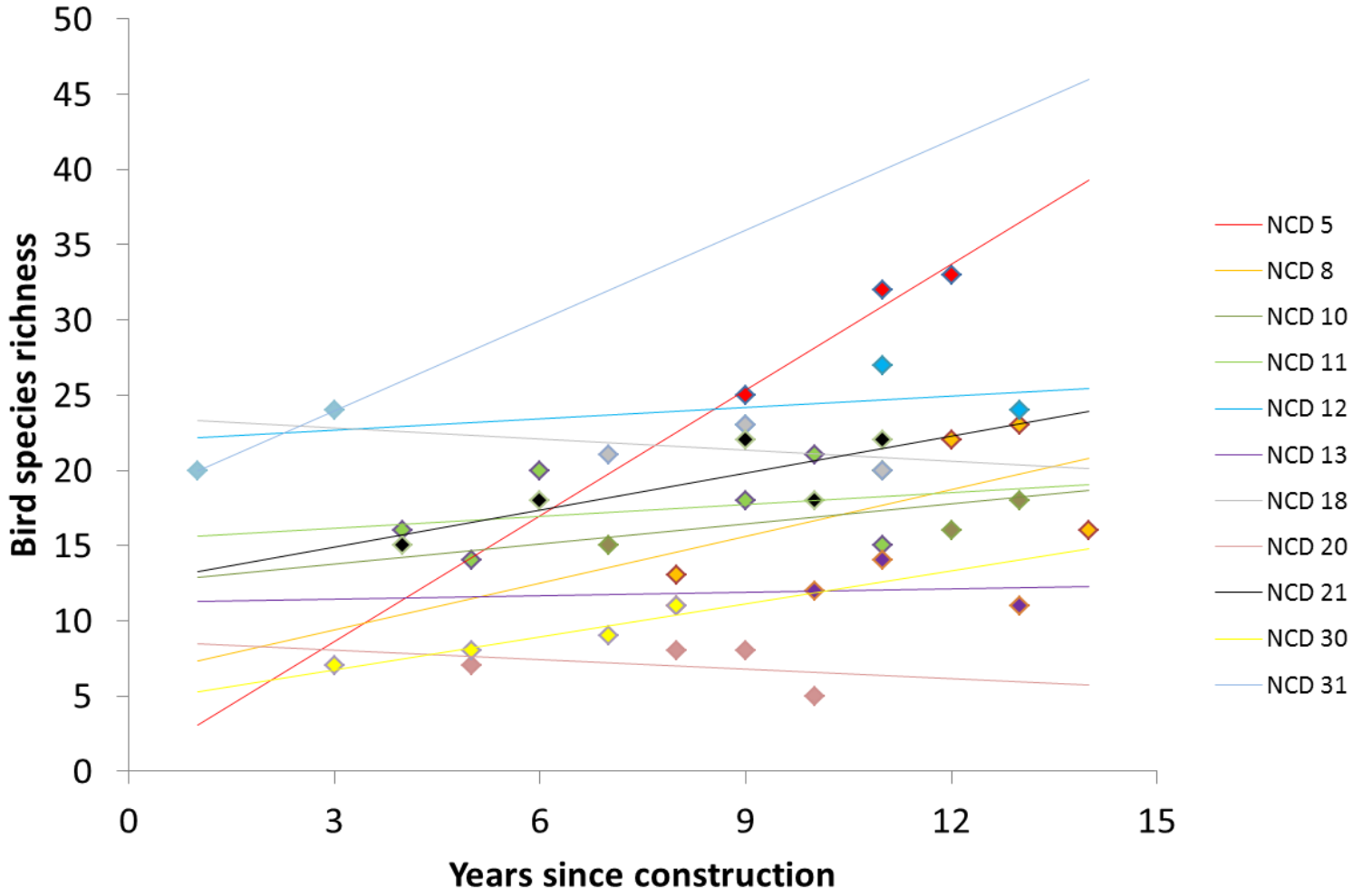






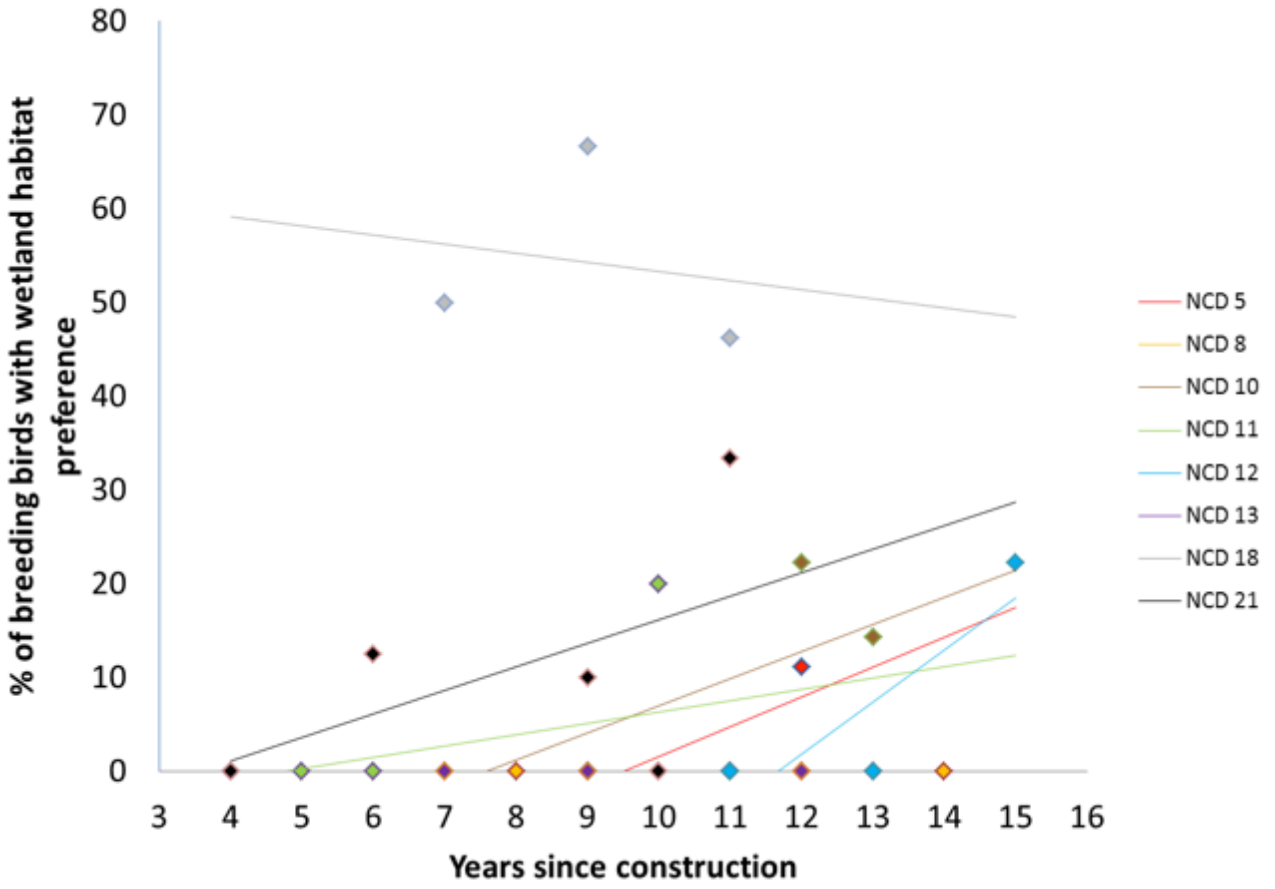
Breeding Birds – Species Richness

- NS
- Baseline data (pre-restoration) likely would have shown large increases



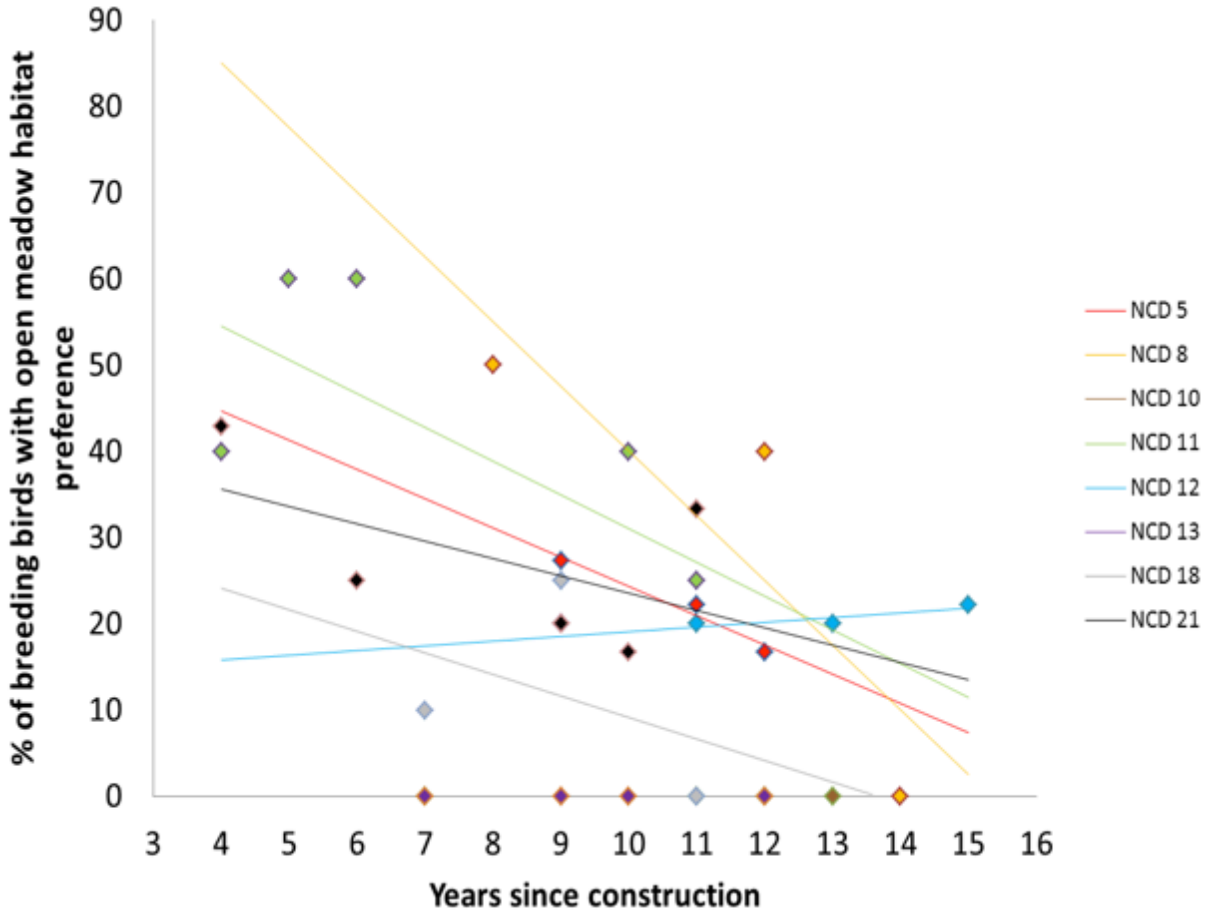
Breeding Birds – Wetland Guild

- Increases



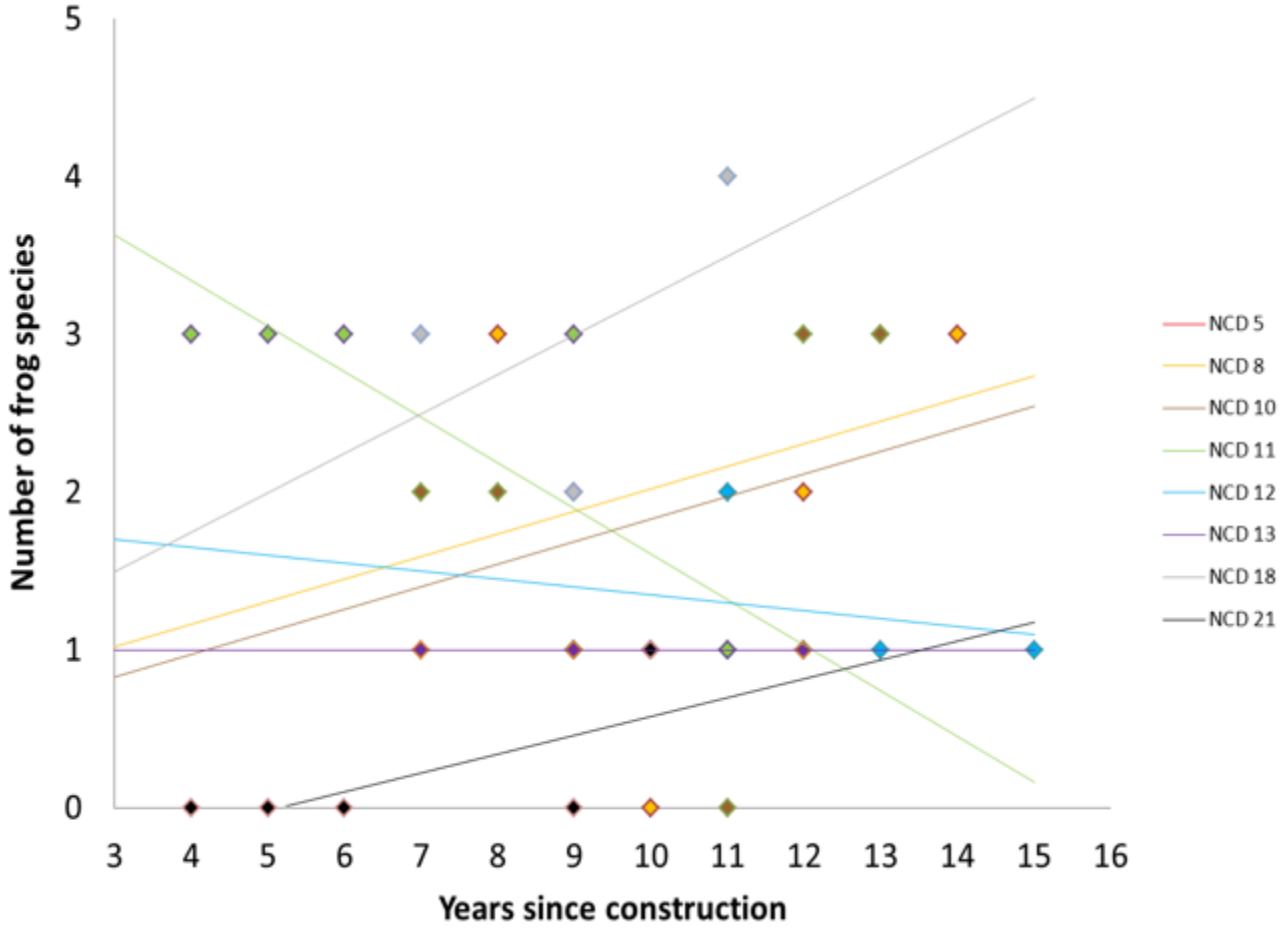
Breeding Birds – Meadow Guild

- Declines
- No change in birds using sparse shrub or forest edge but may occur in the future



Frogs – Species Richness

- Frog species richness was relatively stable at most NCD sites
- Range 0 - 4



Incidentals

- Commonly encountered species include
  - Beaver, eastern chipmunk, eastern cottontail, mink, muskrat and white-tailed deer, red fox, domestic cats, racoon
  - Moderate tolerance and adaptation to natural areas within more urbanized landscapes

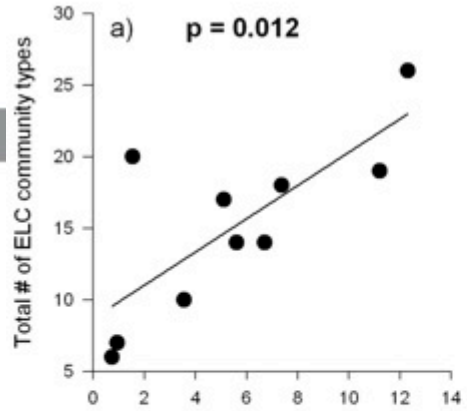
- Meadow vole
- Three midland painted turtles
- Coyote
- Common snapping turtle (L2)
- Northern short-tailed shrew (L3)
- Meadow jumping-mouse (L3)
- Red squirrel
- Eastern gartersnake

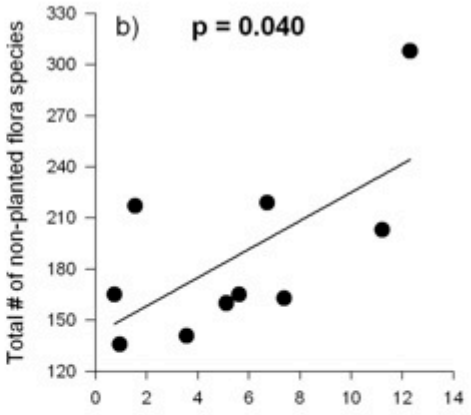
Notable Observations

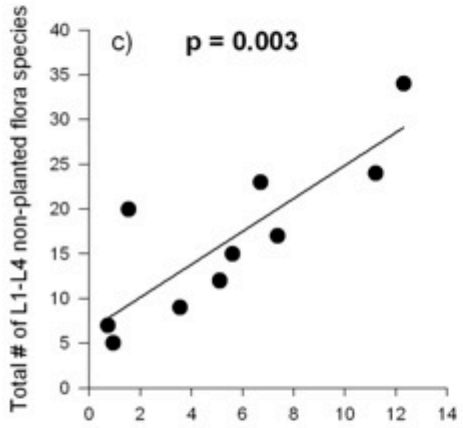
- Burndenet Creek (NCD 8)
  - L3 community (Red Maple Mineral Deciduous Swamp) replaced by Common Reed Mineral Shallow Marsh (also fringing north pond)
  - Common snapping turtle (SAR and L2-ranked)
- Morningside Creek (NCD 18)
  - A large site with several pairs of swamp sparrows
  - Wood frog (L2) (and highest frog species richness of all sites)
- Highland Creek (NCD 5)
  - Two L2-ranked communities: Mineral Fen Meadow Marsh, Open Clay Barren

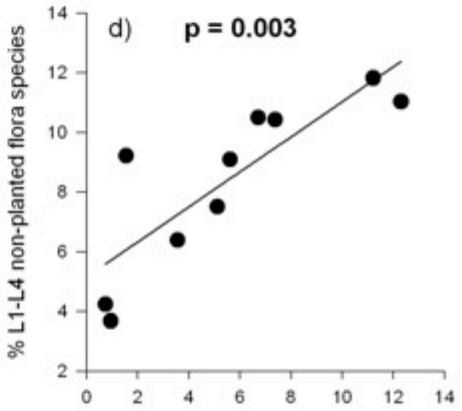
Species-area Relationships - Flora

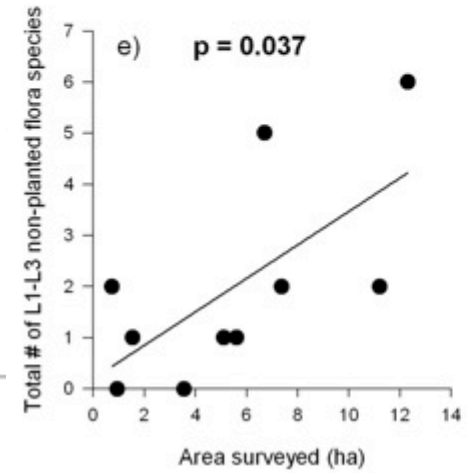
- Site size is an important predictor of species richness and richness of vegetation communities

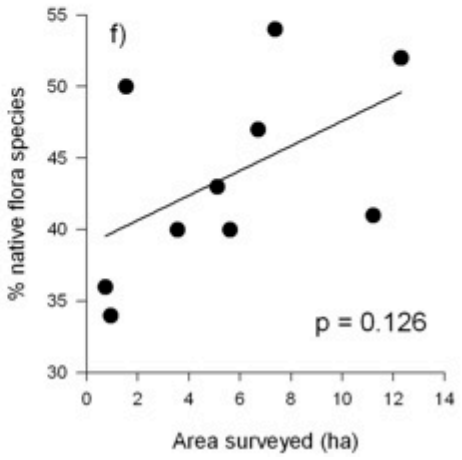




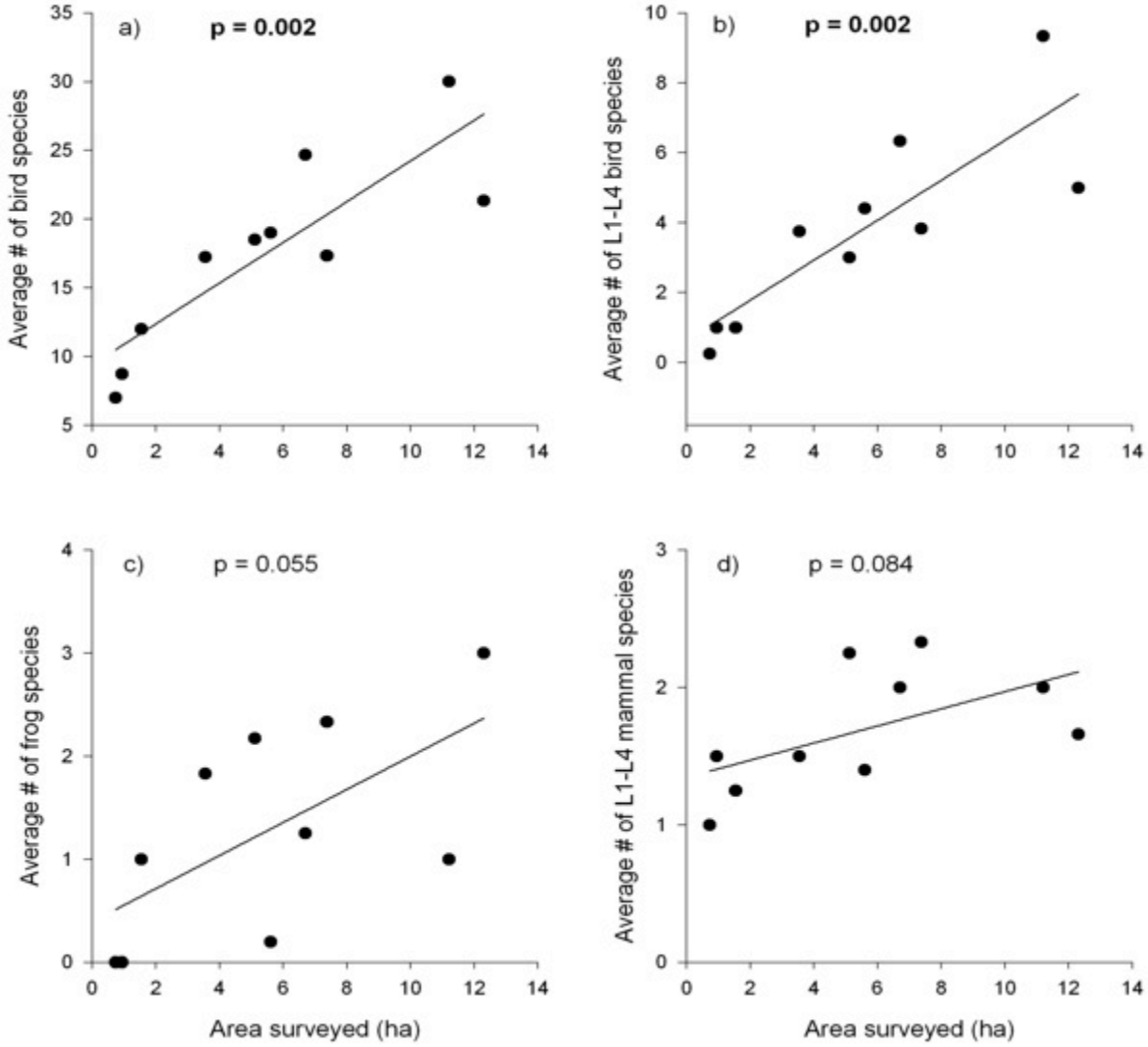








Species-area Relationships - Fauna



Summary

- NCD sites provide natural space for vegetation communities, flora and fauna communities (and some rare/sensitive species)
- Planted flora are doing exceptionally well when planted in suitable conditions
- Sites are shifting to more wetland and aquatic natural cover types (beaver/restoration) and bird communities are responding to these changes
  - Scrub communities maturing and may change composition further
  - Wetland restoration a good feature to include
- Larger sites contained a greater number of vegetation communities and this corresponded to greater flora and fauna species richness

Further Improvements to Restoration and Terrestrial Monitoring

- Use geo-referenced locations of invasives to target removal
- Flora intended for planting should be better checked for proper labelling, native status and proper environmental conditions for plantings (e.g. soil, slope)
- Future NCD projects should be surveyed using a standardized methodology (e.g. point counts, transects) pre- and post- restoration and reference sites should be concurrently surveyed

Acknowledgements

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  - S. Hayes, G. Miller, P. Prior, N. Gonsalves, D. Tune

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