A Canadian (Ontario) Perspective on River Restoration

Ed Gazendam, Ph.D., P.Eng.
President, Sr. River Engineer
Water's Edge

Finding Common Ground

National Stream Restoration Conference
August 21 - 23, 2023
Baltimore, MD

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Overview

1. The Canadian/Ontario Big Picture
2. Where did we come from
3. What are we using/doing
4. Status and Issues
5. Conclusions

1) The Big Picture

British North American Act (1867)

Federal Legislation
- Fisheries Act – “No Net Loss”

Provincial Legislation
- Clean Water Act 2006 (source protection/multi-barrier)
- Water Resources Protection Act (surface/groundwater)
- Environmental Protection Act (pollution)
- Environmental Assessment Act (process)
- Lakes & Rivers Improvement Act (hydropower, etc)
- Drainage Act

1) The Big Picture

Municipal Legislation

- Provincial Policy Statement (general policy direction on hazard land, planning, agriculture, etc).
- Planning Act

Conservation Authorities (36 across Ontario – watershed-based planning units)

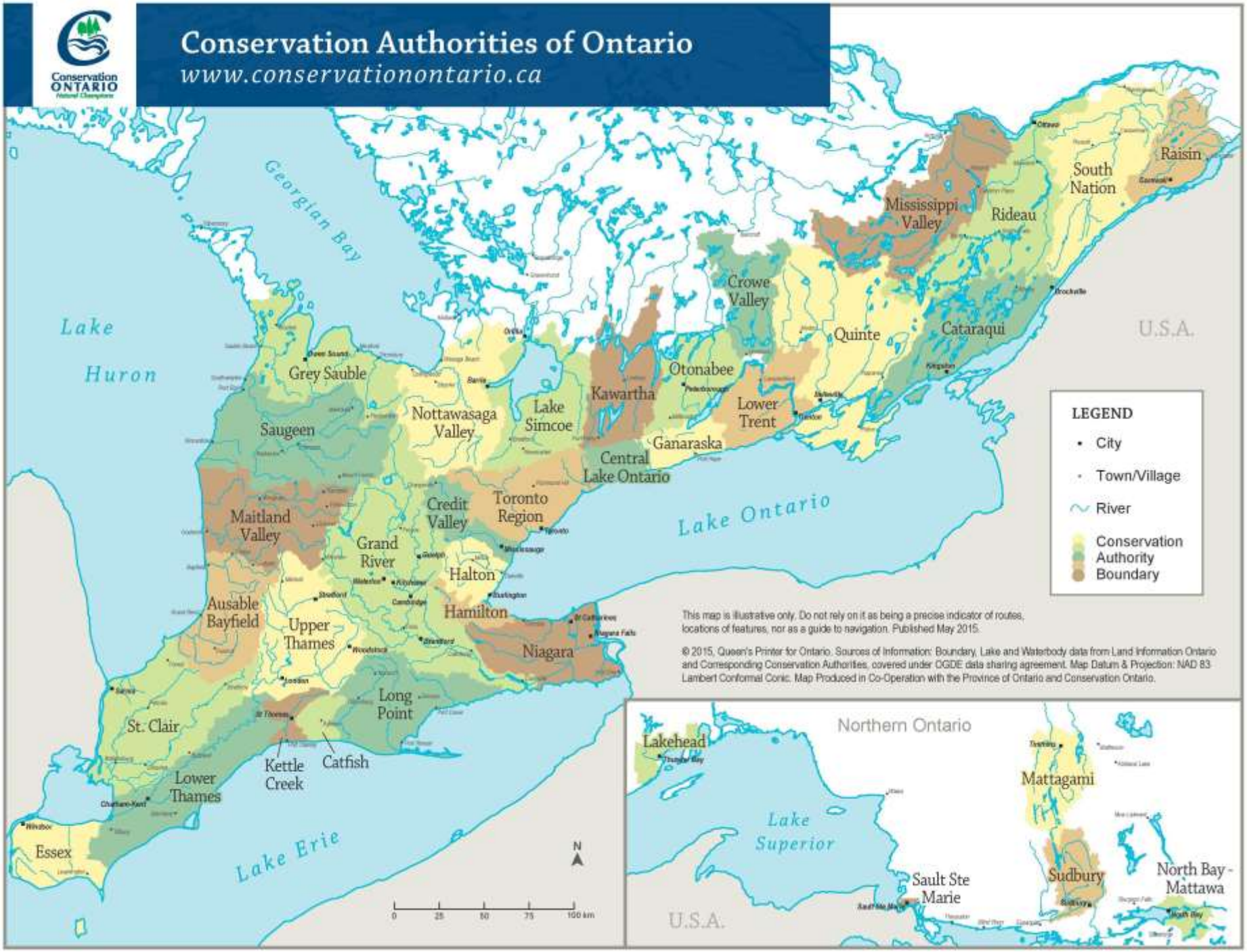
- Conservation Authorities Act

IJC:

- Great Lakes Charter
- Great Lakes Water Quality Agreement

Conservation Authorities of Ontario

www.conservationontario.ca



This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation. Published May 2015.

 Sources of Information: Boundary, Lake and Waterbody data from Land Information Ontario and Corresponding Conservation Authorities, covered under OGDE data sharing agreement. Map Datum & Projection: NAD 83 Lambert Conformal Conic. Map Produced in Co-Operation with the Province of Ontario and Conservation Ontario.

2) Where did we come from?

30-40s: Conservation Movement

50s: Hurricane Hazel (1954) (Floodplain Management)

70s: 5 & 100 - Post to Pre Controls

80s: Master Drainage Plans

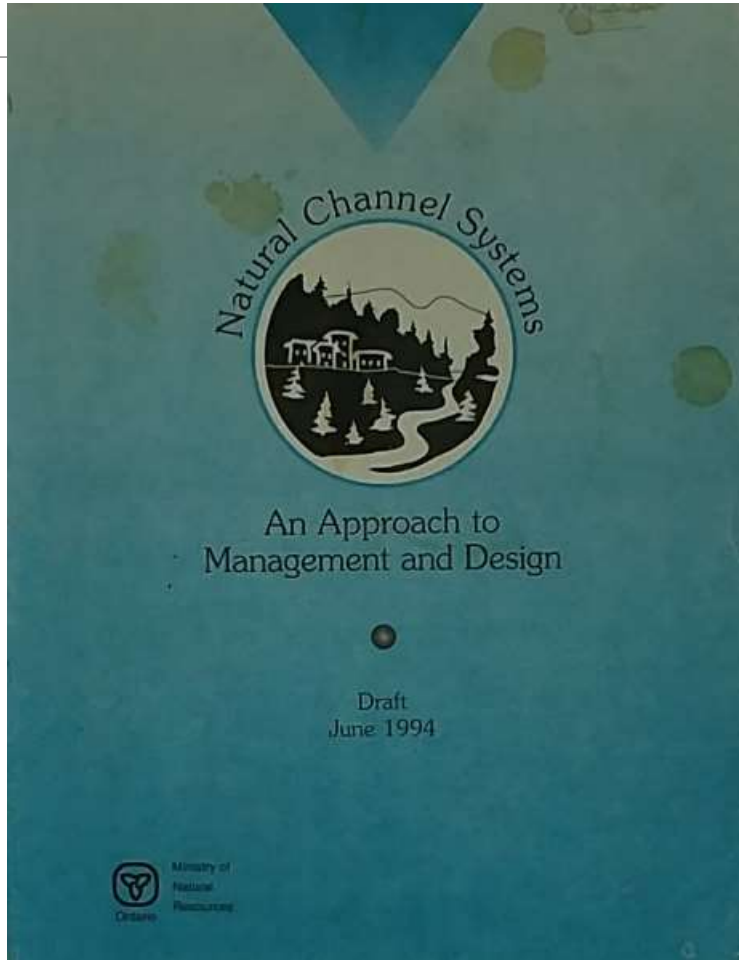
90s:

- Water Quality (CW and WW)
- Source Controls
- Watershed Plans

2) Where did we come from?

90s: Dave Rosgen

The Blue Book (on NCD)



Post 1994

“Brownian”

“Picturesque”

1994 - 2002

No Name Creek

Natural Channel Design Brief:

OUR PROPOSED CHANNEL IS ....

..... 0.015% SLOPE .....

..... 100 M LONG .....

.....5 METRES WIDE ....

..... blah blah blah ..... **AND THE DESIGN WILL BE A ROSGEN C4.**

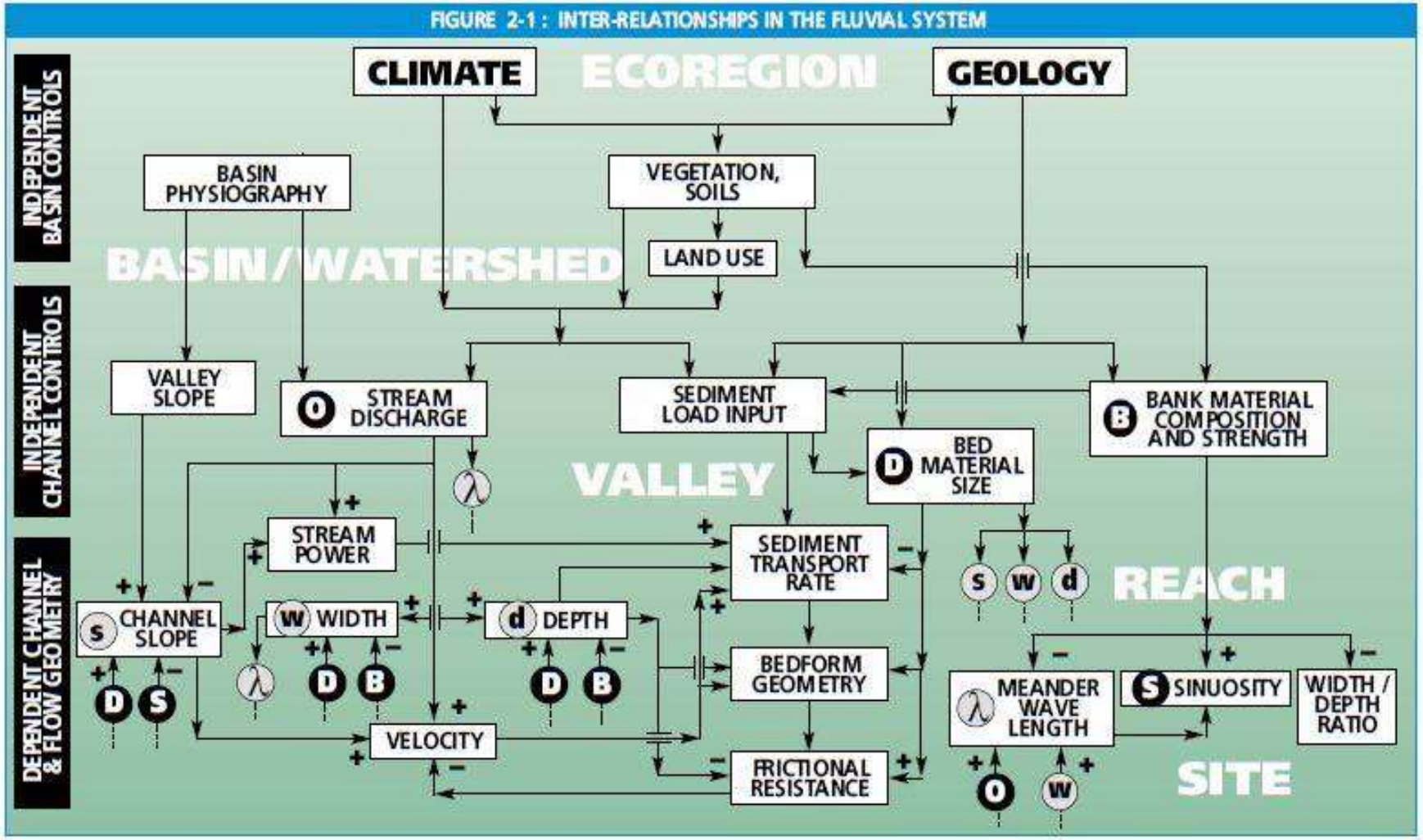
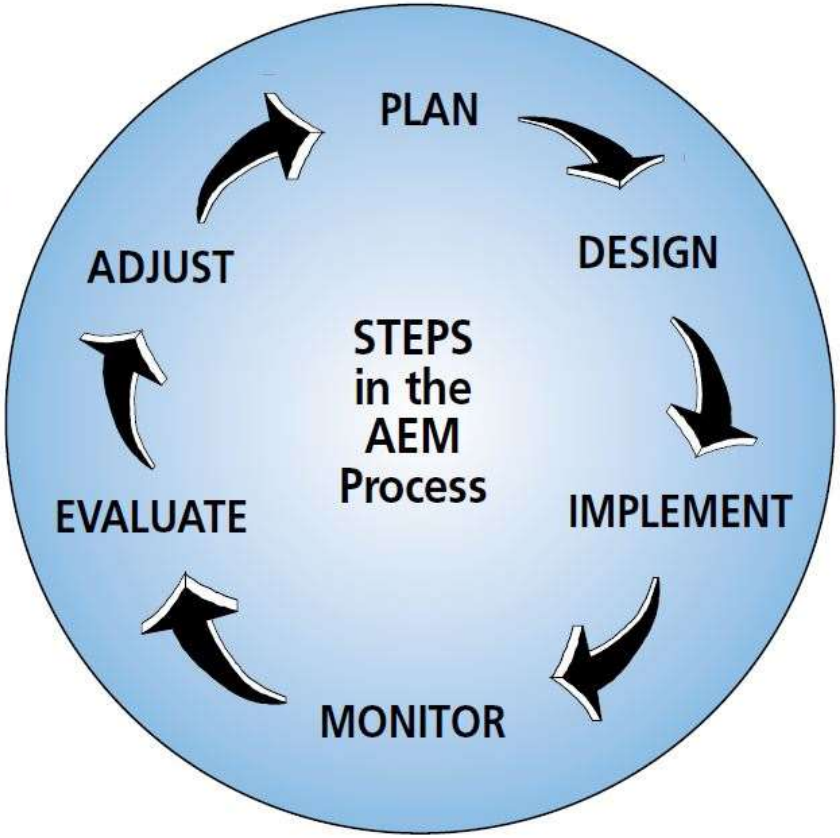
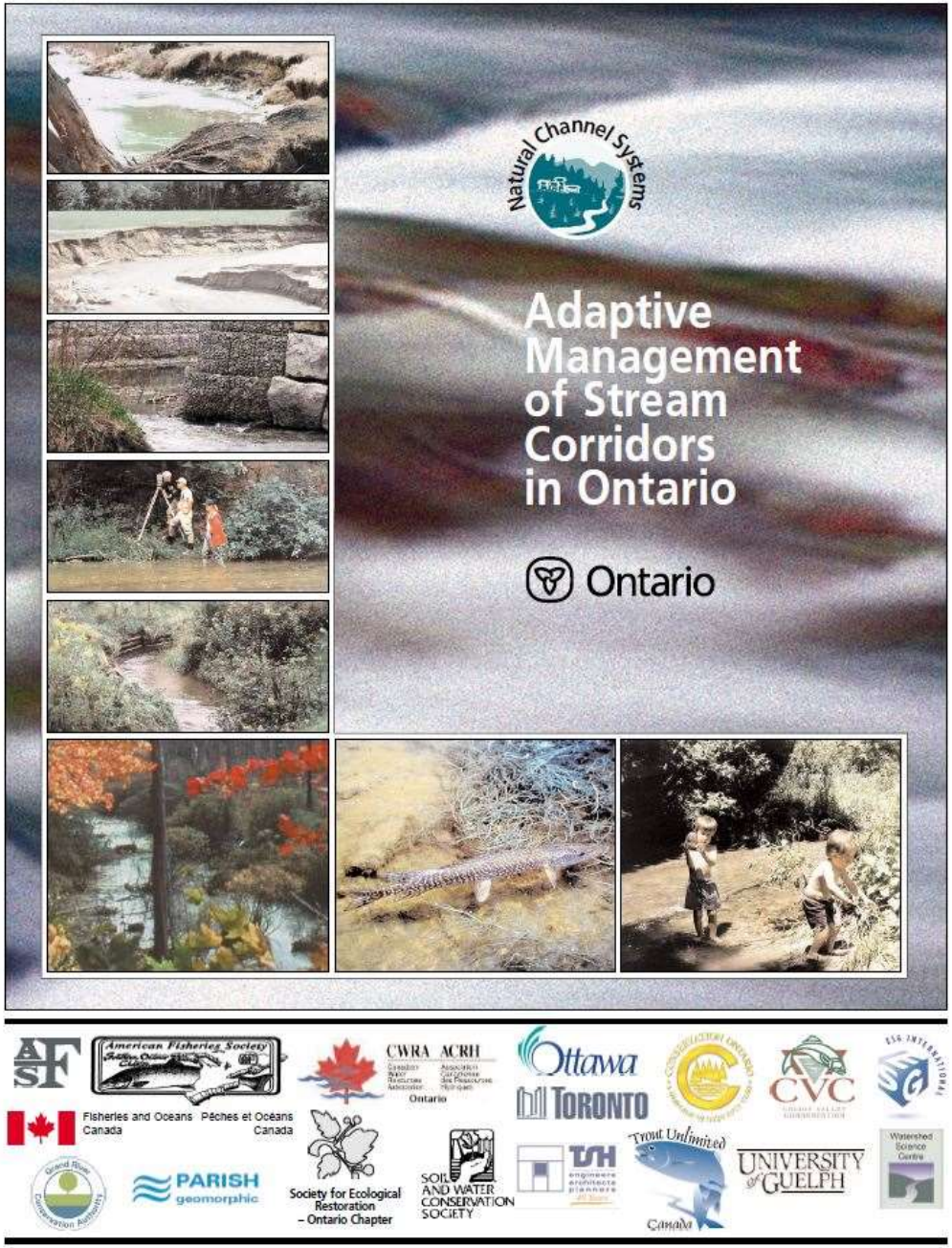


FIGURE 2-1 : INTER-RELATIONSHIPS IN THE FLUVIAL SYSTEM
INDEPENDENT BASIN CONTROLS
INDEPENDENT CHANNEL CONTROLS
DEPENDENT CHANNEL & FLOW GEOMETRY
CLIMATE
ECOREGION
GEOLOGY
BASIN PHYSIOGRAPHY
VEGETATION, SOILS
LAND USE
BASIN / WATERSHED
VALLEY SLOPE
Q STREAM DISCHARGE
SEDIMENT LOAD INPUT
B BANK MATERIAL COMPOSITION AND STRENGTH
D BED MATERIAL SIZE
VALLEY
STREAM POWER
SEDIMENT TRANSPORT RATE
S CHANNEL SLOPE
w WIDTH
d DEPTH
BEDFORM GEOMETRY
VELOCITY
FRICTIONAL RESISTANCE
s w d
REACH
MEANDER WAVE LENGTH
S SINUOSITY
WIDTH / DEPTH RATIO
SITE



Adaptive Environmental Management
Interdisciplinary / Naturalized / Monitoring



Result: 2002 Manual

2) Where did we come from?

00/10s:

- Walkerton (contaminated water supply)
- Clean Water Act
- Drinking Water Source Protection Program >> multi-barrier approaches
- SWM tied to Channel Morphology >> Erosion Threshold Assessments
- Drainage Superintendents restoring ditches using NCD concepts in order to protect wetlands using the Drainage Act!!!
- LID – Low Impact Development

3) What are we using?

Ontario has a variety of assessment tools that are used to assess stream conditions :

- MOE - Rapid Geomorphic Assessment (RGA)
- Rapid Stream Assessment Technique (RSAT)
- Biological Community Indices e.g. IBI, ICI, Richness, %EPT, etc
- CABIN (Canadian Aquatic Biomonitoring Network)
- OBBN – (Ont. Benthic Biomonitoring Network)
- MNR - Ontario Stream Assessment Protocol (OSAP)
- Limited use of QHEI

None expressly used for design purposes

3) What are we using/doing?

Modelling tools:

- Hydraulics: HEC RAS 1D/2D, MIKE products
- Hydrologic: HEC HMS, HYMO-based variants, QUAL-XXX, MIKE,
- HSI, IBI, RSAT, RGA
- Sediment Transport / Channel shear

Approaches: Form-based / Processed-based / Rosgen / Newbury / Manning's / Wilcock / Reference Reaches / Multi-Stage Channels / Combinations

Purpose: Habitat-based Rehab / Property Protection / Infrastructure

3) What are we using/doing?

Conferences: 1994 (Niagara Falls), 1999 (Niagara Falls), 2004 (Ottawa), 2010 (Mississauga), 2016 (Niagara Falls)

Ongoing:

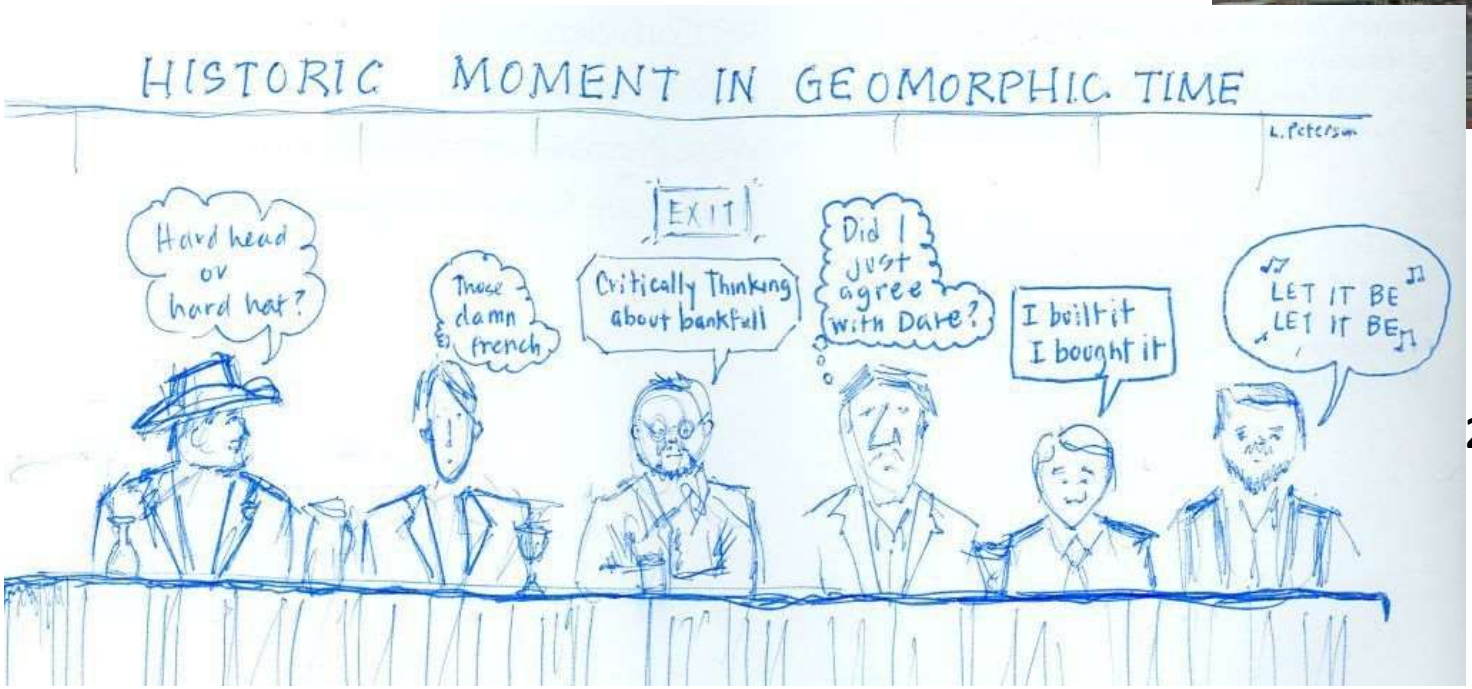
- NATURAL CHANNEL CONFERENCES – ~ Bi-Annual (2018, 2023)
- MONITORING SYMPOSIUM (2017) – Post-Construction Approaches
- STREAM RESTORATION SYMPOSIUM (2019) - Lessons Learned from other Jurisdictions (Brad Fairley)
- DFO HABITAT OFFSETTING AND BANKING POLICY (2021)
- IECA – Annual Conferences with NCD Stream
- DRAINAGE ENGINEERS CONFERENCE – Annual but limited NCD Presentations and Involvement

3) What are we using/doing?

Conferences:

Mid-West (PRRSUM) / Mid-Atlantic

2013



2007

Rosgen Hey Parker Simon Harmon Kondolf (Reds Wolman)

3) What are we using/doing?

- Stage Zero approaches
- Nature-Based Solutions
- Focus on resiliency (climate change driven)

3) What are we doing (wrong):

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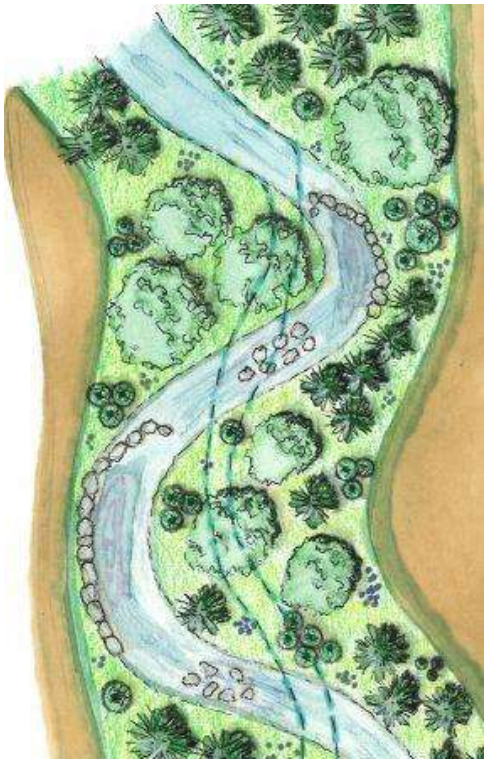
Sponge Bob Square Pool



DESIGN

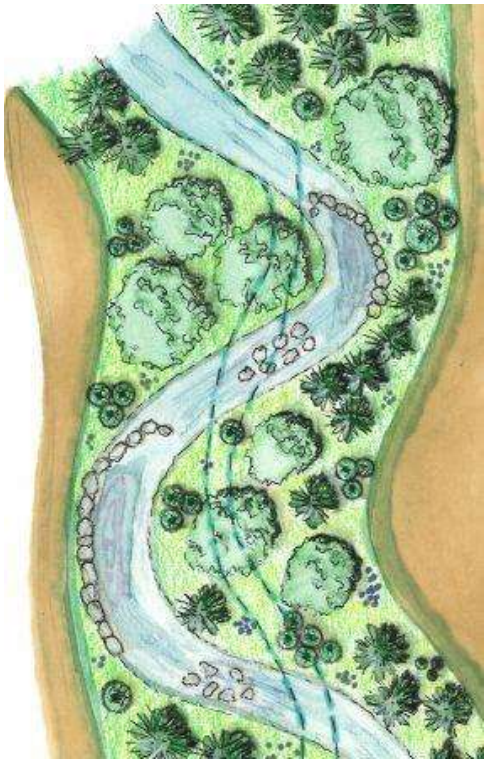
OR

DESIGN

IMPLEMENTATION

CONSTRUCTION

UNATTAINABLE GOALS



DESIGN

OR

DESIGN

IMPLEMENTATION

CONSTRUCTION

UNATTAINABLE GOALS

4) Status & Issues with the NCI:

1. NCD initiative has no mentor / agency ownership

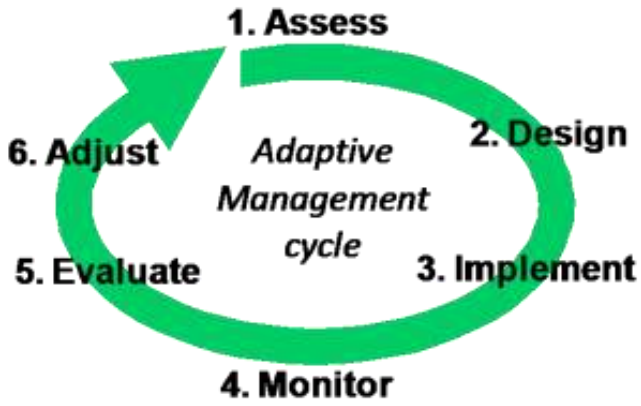
   i.e. everyone is interested but no one is in charge

4) Status & Issues with the NCI:

2. Fluvial Geomorphology on urban streams – agency expectations vs reality (shale, infrastructure, limits, etc)

4) Status & Issues with the NCI:

3. Monitoring:
   - Adaptive Environmental Management
   - Inconsistent tools
   - Minimal Evaluation and Adjusting
   - Lack of data sharing / no repository
   - No data to determine success / failure



4) Status & Issues with the NCI:

4. Habitat Banking is in nascent form

- No 3rd Party Banking and therefore no market forces driving quality and pricing
- Regulatory agencies (primarily DFO and CAs) generally not able to review as there are no qualified staff
- No systematic method of evaluating success (no tools)

5) Conclusions:

1) Natural Channels Initiative (Province of Ontario):

- Phase 1 – 1994 manual and conference
- Phase 2 – 1999 and 2004 conferences and new manual
  (Adaptive Management of Stream Corridors in Ontario)
- Now currently in Phase 3: (still)
  - Certification of practitioners
  - Monitoring standards
  - Case studies
  - Database of NC projects
  - Training
  - Conferences
  - Technology transfer
  - Agency Mentorship

5) Conclusions:

2) Some good work is being done by practitioners:

Realignment of coldwater trout stream in Oshawa, Ontario

5) Conclusions:

- Education – Interdisciplinary program for river restoration and most universities offer related programs/courses
- Ongoing research at various levels (stream power / shear, erosion, braided rivers, sediment transport, etc)
- Non-Profit Organizations getting funding and doing work

  e.g. Trout Unlimited Canada – Ducks Unlimited - Streamkeepers
- Limited use of Habitat Banking – by a few cities for use in their city
- Building in resilience / NBS

River Restoration isn't rocket science.

It's much more difficult than that!

(Jack Imhof on various occasions, TUC National Biologist)

Protect the Best, Restore the Rest

(Dave Rosgen)

Happy Fishing !!
Questions?


TORONTO
BLUE JAYS