



EcoStream Conference,
Asheville, NC
August 14-16, 2018

Stream Restoration
and Fish Habitat
Banking in Canada



Agenda

1. Background
2. Functional Assessment
3. Calculating Fish Habitat Credits
4. Case Studies
5. Summary
6. Questions

Background

Background

- USEPA – Clean Water Act
- Federal Department of Fisheries and Oceans – Fisheries Act



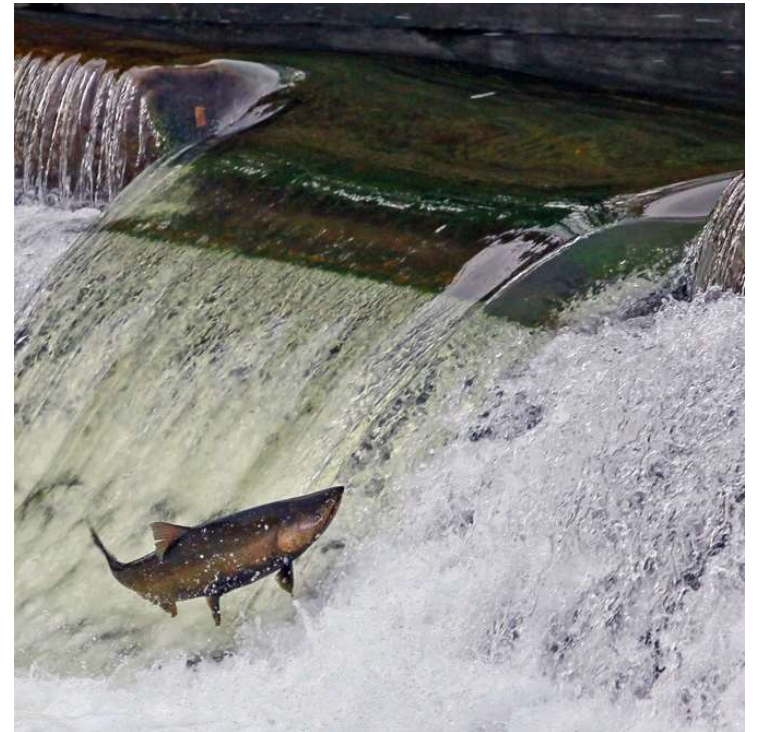
Federal Fisheries Act

- Fish
- Fish Habitat
- \$5M and/or Jail Time
- Authorization
- Offsetting/Compensation = Restoration



Federal Fisheries Act

- Rewritten in 2009
- Policy changes to allow habitat banking
- Habitat banking arrangement:
 - Signed by proponent and DFO
 - Type of bank (e.g., warmwater)
 - Service area
 - Credit release schedule
- 2 fish habitat banks (Kitchener, London)



Functional Assessment

Functional Assessment

Developed by DFO and Stantec:

- Geomorphology
- Vegetation
- Benthics
- Fish



Geomorphology

- Rapid Geomorphic Assessment
- Ratio of Riffle Length to Pool Ratio
- Ratio of Riffle-Depth to Pool Depth
- Survey (e.g., X-sections, long pro, pebble counts)

STANTEC CONSULTING LIMITED		RAPID GEOMORPHIC ASSESSMENT			
Watercourse:		Balzer Creek	Date:	May 17, 2017	
Location:		Kitchener, downstream of Homer Watson Blvd.	Reach:	2a	
FORM/ PROCESS	GEOMORPHIC INDICATOR		PRESENT		FACTOR VALUE (6)
	NO (2)	DESCRIPTION (3)	NO (4)	YES (5)	
Evidence of Aggradation (AI)	1	Lobate bar		X	
	2	Coarse material in riffles embedded		X	
	3	Siltation in pools		X	
	4	Medial bars		X	
	5	Accretion on point bars		X	
	6	Poor longitudinal sorting of bed materials		X	
	7	Deposition in overbank zone		X	
SUM OF INDICES			0	7	1.00
Evidence of Degradation (DI)	1	Exposed bridge footings		X	
	2	Exposed sanitary/storm sewer/pipeline/etc.		X	
	3	Elevated stormsewer outfall(s)		X	
	4	Undermined gabion baskets/concrete aprons/etc.		X	
	5	Scour pools d/s of culverts/stormwater outlets		X	
	6	Cut face on bar forms		X	
	7	Head cutting due to knick point migration		X	
	8	Terrace cut through older bar material		X	
	9	Suspended armour layer visible in bank		X	
	10	Channel worn into undisturbed overburden/bedrock		X	
SUM OF INDICES			10	0	0.00
Evidence of Widening (WI)	1	Fallen/leaning trees/fence posts/etc.		X	
	2	Occurrence of large organic debris		X	
	3	Exposed tree roots		X	
	4	Basal scour on inside meander bends		X	
	5	Basal scour on both sides of channel through riffle		X	
	6	Gabion baskets/concrete walls/etc. out flanked			X
	7	Length of basal scour > 50% through subject reach			X
	8	Exposed length of previously buried pipeline/cable/etc.		X	
	9	Fracture lines along top of bank		X	
	10	Exposed building foundation		N/A	
SUM OF INDICES			7	2	0.22
Evidence of Planimetric Form Adjustment (PI)	1	Formation of chutes		X	
	2	Single thread to multiple channel		X	
	3	Evolution of pool-riffle form to low bed relief form		X	
	4	Cutoff channel(s)			X
	5	Formation of island(s)			X
	6	Thalweg alignment out of phase with meander form			X
	7	Bar forms poorly formed/reworked/removed			X
SUM OF INDICES			1	6	0.86
STABILITY INDEX (SI) = (AI + DI + WI + PI) / m					0.52

source: MCE 2003

Vegetation

- Survival rates for planted floodplain vegetation
- Vegetation coverage of stream banks



Benthic Invertebrates

- Shannon Weiner Diversity Index
- Hilsenhoff Biotic Index
- Percent EPT
- Taxa Richness



Fish

Index of Biological Integrity:

- Species Richness
- Local Indicator Species
- Trophic Composition
- Fish Abundance



Calculating Fish Habitat Credits



Calculation

- Calculate the maximum fish habitat area based on $\frac{1}{2}$ bankfull area
- Do the field work and then convert the Geomorphic, Vegetation, Benthic and Fish Scores to a % of 1
- Calculate the reach score:

$$\text{Reach Score} = \frac{\text{Geomorphic Score} + \text{Vegetation Score} + \text{Benthic Invertebrate Score} + \text{Fish Community Score}}{4}$$

- Multiply Reach Score by $\frac{1}{2}$ bankfull area to get m^2 of fish habitat credits

Case Studies



Case Studies

- Filsinger
- Balzer
- Idlewood
- Mathers
- Tributary C

Filsinger

- Naturalization of 2.0 km of concrete lined channel
- 0 m² of existing fish habitat
- 12,600 m² of warmwater fish habitat
- Used to develop the first fish habitat bank



Balzer

- Restoration of 800 m of degraded urban channel
- Badly overwidened – used Regional curve to determine bankfull width
- 1,438 m² of warmwater fish habitat credits



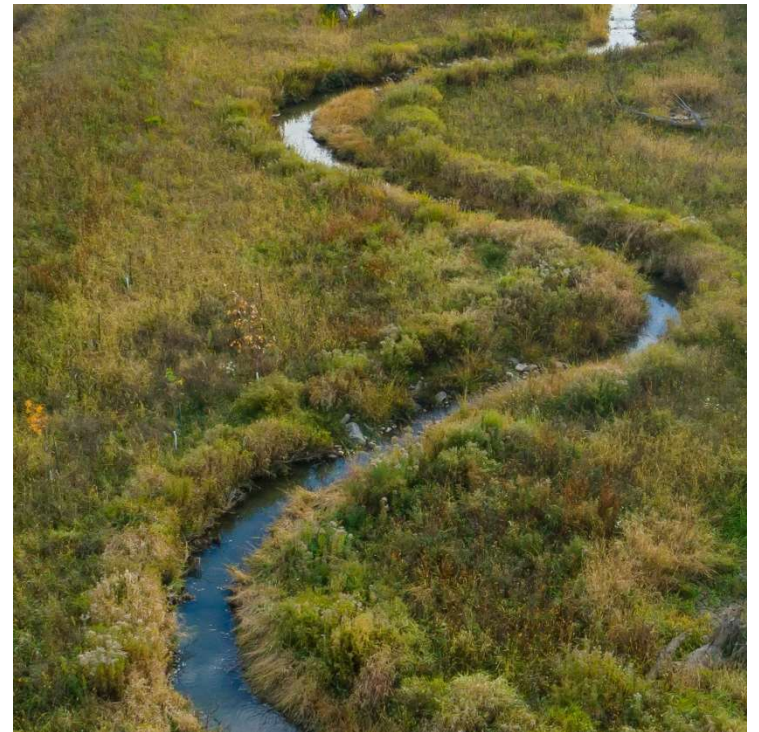
Idlewood Creek

- Removal of two dams and gabion channel
- Restoring upstream fish passage
- $\frac{1}{4}$ bankfull area upstream of dam
- 4,600 m² of coolwater fish habitat credits



Mathers

- Daylighting 800 m of stream channel
- 0 m² existing fish habitat
- 1,900 m² of warmwater habitat credits



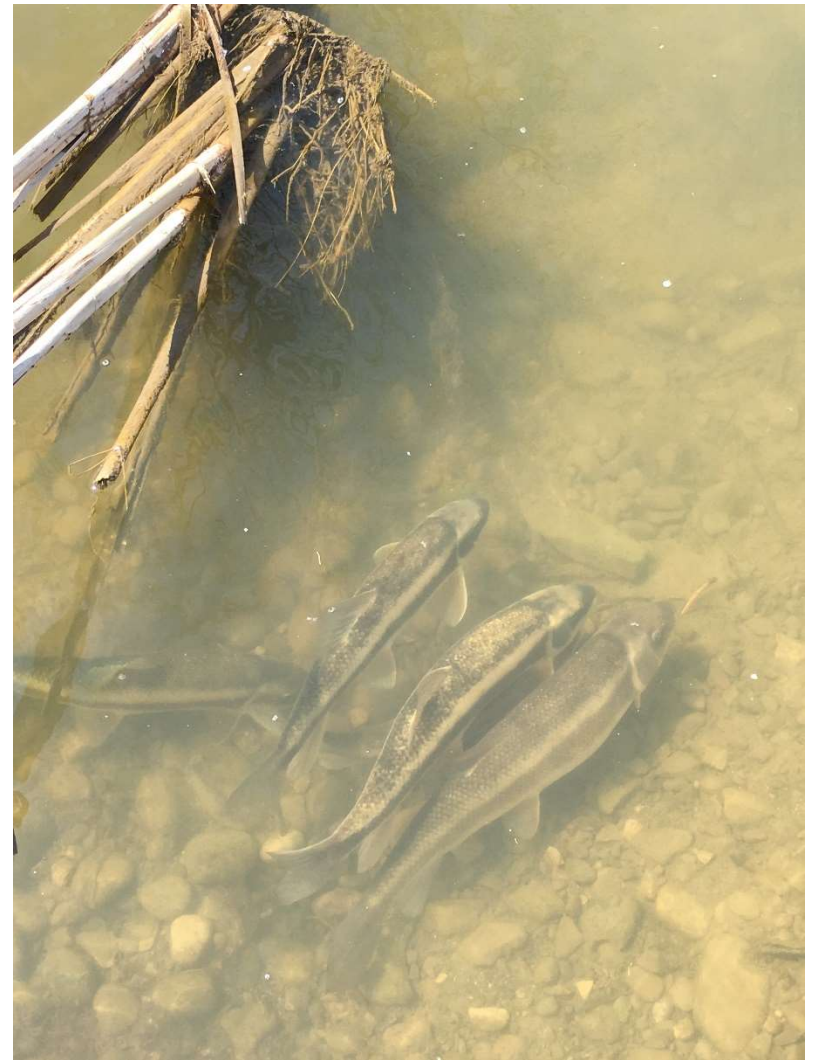
Tributary C

- Restoration of 330 m of degraded channel and removal of fish passage barrier
- Some existing fish habitat
- Potential for 490 m² of warmwater fish habitat



Status

- 2 fish habitat banks up and running
- 7 more to come
- Proponent banks
- Methodology needs refinement
- 3rd Party Banking not resolved
- DFO is supporting habitat banking



Lessons Learned

- DFO supports fish habitat banking (e.g., written into the new Fisheries Act)
- DFO is open to ideas (e.g., methodology, post-construction monitoring)
- Rules have not yet been written
- Some design philosophies are better suited to fish habitat banking than others
- Some sites are better suited to fish habitat banking than others: (e.g., Concrete-lined or piped channels represent the best sites)

Summary

Summary

- Fisheries Act is driving force behind stream restoration
- Fish habitat banking is new in Canada
- First fish habitat bank done in 2017
- Methodology based on functional assessment including quantitative data for geomorphology vegetation, benthics and fish
- Opportunities to refine methodology
- Need to address 3rd Party Banking

Questions?

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