Cost-effectiveness of wetlands as a nature-based solution to buffer phosphorous in Canadian landscapes

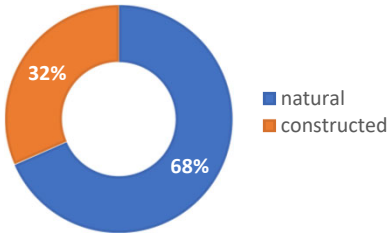
Predrag Rajsic*, Roy Brouwer, Angelos Alamanos
University of Waterloo, Waterloo, Canada
*prajsic@uwaterloo.ca

INTRODUCTION

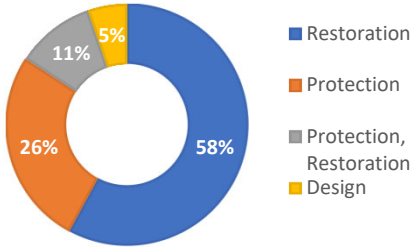
- Wetland loss over the past decades is well documented.
- Wetlands provide many environmental benefits including phosphorous removal from surface water.
- There are **trade-offs** between wetlands' environmental services and
  - ✓ alternative land uses
  - ✓ investing in other resources
  - ✓ other impacts of wetlands (i.e., nuisance).
- There are also **trade-offs** between using wetlands versus other means of reducing phosphorous emissions.
- Objectives:
  - Synthesize the available Canadian literature on the phosphorous removal potential of wetlands and costs of wetland preservation and/or restoration;
  - Produce quantitative estimate of the per kg of P removal costs of wetlands;
  - Asses the factors affecting the costs of P removal by wetlands.

DATABASE STRUCTURE

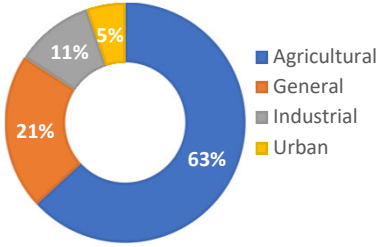
NATURAL ACCOUNTS FOR THE MAJORITY OF 'TYPE OF WETLAND (CONSTRUCTED OR NATURAL)'.



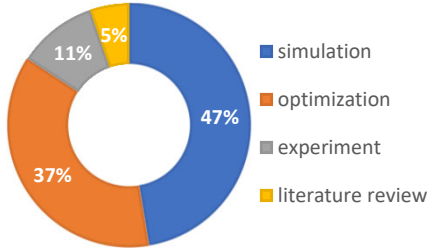
'WETLAND PURPOSE': RESTORATION ACCOUNTS FOR THE MAJORITY OF STUDIES.



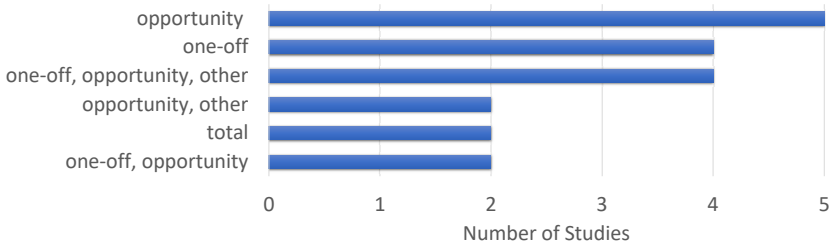
'SOURCE OF POLLUTION': AGRICULTURAL ACCOUNTS FOR THE MAJORITY OF STUDIES.



'METHOD': SIMULATION AND OPTIMIZATION APPEAR MOST OFTEN.

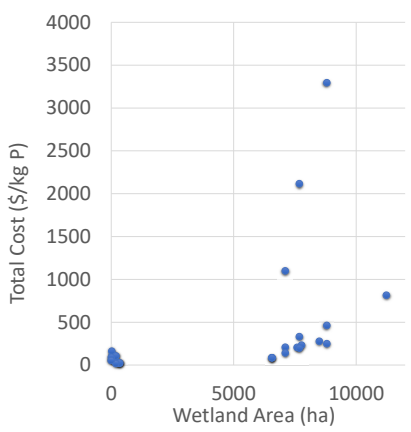


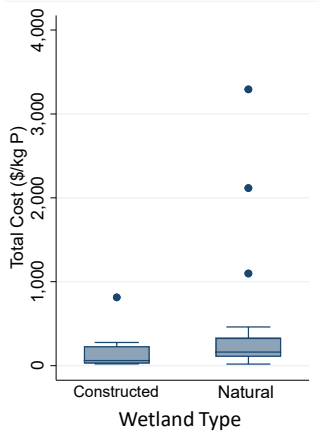
Types of Costs Reported



PRELIMINARY RESULTS

	Average	Median	Min.	Max.	St. Dev.
Study Age (yrs)	11.56	9	1	30	7.86
Latitude(°)	48.60	49.85	42.82	57.32	4.00
Wetland Area (ha)	24,312	316	0.01	810,000	112,296
Baseline Load of P (kg/ha/yr)	4895	4760	4760	5300	241
Emission Reduction (kg/ha/yr)	11.20	1.14	0.20	99.56	20.28
Productive Time (yrs)	143.97	30	1	1000	318.17
One-off Cost ($/ha/yr)	4,308.47	2,219.83	38.40	36,109.16	7,240.44
Opportunity Cost ($/ha/yr)	319.27	148.68	32.59	2,476.05	436.11
Other Costs ($/ha/yr)	705.58	266.68	1.90	3,538.27	983.08
Total Cost ($/ha/yr)	2,225.98	331.82	20.90	36,109.16	5,108.39
Total Cost ($/kg P)	361.88	118.65	17.44	3,292.91	695.76





SUMMARY & NEXT STEPS

- Still a very small number of studies that assess both phosphorous removal and costs for wetlands.
  - Among those, there is a wide range of methods for cost calculation and reporting, making comparisons challenging.
- Developing a standard for reporting costs of wetland preservation and restoration may be beneficial for future economic evaluation of wetlands.
- P removal cost: median $120/kg, average $362

Next steps:

- ✓ Estimate multivariate regression
- ✓ Assess the impact of major factors on the cost of Phosphorous removal and compare with other