GIS and freshwater ecosystem services valuation under climate change and conservation

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Outline

- Introduction
- Study area and methods
- Results
- Discussion and conclusion









Introduction

- Direct and indirect benefits of freshwater ecosystem services (ES)
- Uncertainty from climate and anthropogenic changes
- Agricultural intensification and declining institutional interests in conservation





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Study area and methods

- Portneuf river catchment as an agricultural semi-arid basin
- High in CRP enrollment

University of Idaho

Department of Geography

River listed as impaired under the federal Clean Water Act

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Results

Spatial variation

University of Idaho

Department of Geography

- Mountainous areas as "water towers"
- Less water scarcity along the matrix diagonal.

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Marsh Creek region sensitive to stressors.



(a) (d) (g) Benchmark (b) (e) (h) **Climate Change** 10 20 Miles 2nd Quartile TN export (kg/ha) 0.373 - 0.637 0.638 - 0.849 0.850 - 1.067 1.068 - 1.471 (c) (f) (i) 1.472 - 2.188 TN export change (%) 3rd Quartile -26.25% - -15% -14.99% - -5% -4.99% - 0% 0.01% - 10% 10.01% - 25% 25.01% - 52.65% **CRP** Decline **CRP** Baseline CRP Reboost+ Portneuf River and Marsh Creek **CRP** Scenario

Total Nitrogen Export

Total Phosphorous Export



CRP Scenario

Results

- Spatial variation
 - High export associated with intensive agricultural practice.
 - Change of rainfall erosivity due to climate change.
 - Difference between the exploitation or conservation land use policy.





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Discussion and conclusion

- Implications for land use management and conservation planning
 - Solve the water scarcity problem
 - Improve water-use efficiency
 - Marsh Creek region with priority
 - Riparian conservation as a high benefit-cost ratio practice

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Thank you! Questions?

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