How to Use Ecosystem Services for Wetlands Conservation Planning in Remote Areas?

Jérôme Cimon-Morin[1, 2, 7], Monique Poulin[1, 3, 4, 5], Marcel Darveau[2, 1, 3, 6]

Introduction

Wetlands are key ecosystems for regional **biodiversity** maintenance and for the delivery of multiple **ecosystem services (ES)**.

Wetlands in the boreal zone of Canada remain barely untouched by human disturbances although industrial pressures should increase in the near future following the application of northern plans for development.

In these regions, the possibility of planning conservation prior to development represents a unique **conservation opportunity.** ES have been proposed as conservation targets.

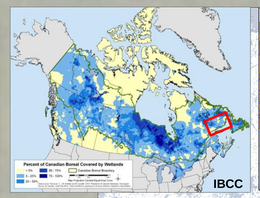
Why use ES as conservation targets?

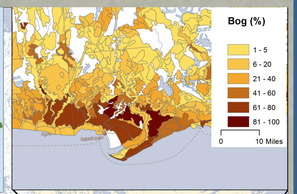
1) To sustain human well-being
2) ES conservation's economic benefits frequently exceed cost
3) ES conservation could help harmonize multiple conservation objectives (e.g. First Nations cultural activities, recreation, renewable natural resources, etc.)

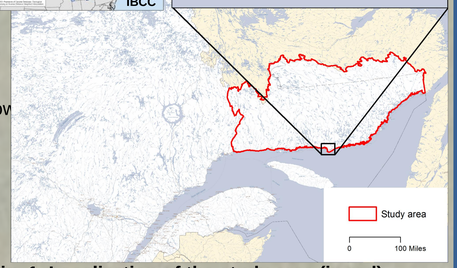
Research Objective

This project aims to develop a wetland conservation approach suited to the vast boreal region of the province of Quebec which would take into account ES provided by wetlands.

Study Area







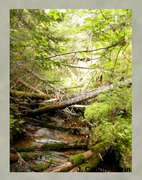
Lower North-Shore Plateau ecoregion, Quebec, Canada:

- 130,000 km², 0.05 inhabitants per km²
- Black spruce-moss vegetation domain
- Wetlands (mostly peatlands and shallow waters) covers ~10% of the study area (Ménard et al. 2006)
- Another 10% is deep water

Planning units :

- > 16,000 polygons of ~10 km²

Fig. 1. Localization of the study area (in red). Enlarged area shows an example of planning units.



Remote Areas' ES Conservation: Issues and Challenges

1. Mapping data limitations

Mapping materials are essential tools in conservation planning. Remote areas are frequently lacking accurate mapping data, thus assessing the diversity of wetlands and their ES is challenging.

2. Lack of spatial concordance between ES and biodiversity

Most ES hotspots do not concord spatially with biodiversity hotspots. ES conservation could therefore be detrimental to biodiversity conservation (Cimon-Morin et al. 2012).

3. Conservation of ES that have never been documented for our study area

ES assessment and quantification can both be challenging and expansive.

4. The beneficiaries' dependence of ES

The conservation value of most ES decrease with increasing distance from human populations or with decreasing accessibility. This raises a question about the relevance of using ES as conservation targets in remote areas.

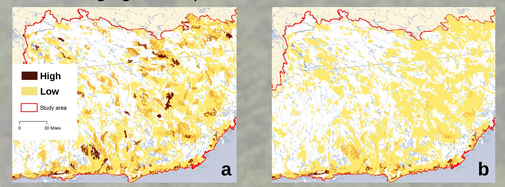


Fig. 2. Cloudberry's conservation values a) based on biophysical production b) weighted for human presence.

Using ES for Conservation

1. Use an exhaustive wetlands typology and ES classification

Our preliminary results suggest that certain types of wetlands are more significant than others with regard to the delivery of certain ES (Fig 2.).

This also indicates a conservation network sensibility depending on which ES are considered.

Thus, we have hypothesized that by increasing the number of ES considered, the resulting network would be more representative of the biodiversity globally (Cimon-Morin et al. 2012).

Ecosystem services \ Wetland typology	Thick Treed bog	Thick non-treed bog	Thin treed bog	Thin non-treed bog	Thick treed fen	Thick non-treed string fen	Thick non-treed non-string fen	Thin treed fen	Thin non-treed string fen	Thin non-treed non-string fen	Marine littoral wetland	Marsh and swamp	Lake - littoral zone	Pond	River	Stream
Carbon sequestration	5	5	5	5	5	4	4	4	4	4	4	4	2	2	1	1
Carbon pool	5	5	3	3	5	5	5	3	3	3	4	4	2	3	1	1
Summer albedo	3	5	3	5	3	5	5	4	5	5	4	4	1	1	2	0
Wild fruits (Cloudberry)	4	3	4	5	1	1	1	1	1	1	1	1	1	1	1	1
Barrier against wildfire	3	4	4	3	3	4	4	3	4	4	0	2	5	5	3	1
Sum	**20**	**22**	**19**	**21**	**17**	**19**	**19**	**15**	**17**	**17**	**13**	**15**	**11**	**12**	**8**	**4**

Table 1. Example of wetland's ES assessment for our study area. Value 0 = no relevant capacity to 5 = most relevant capacity.

2. Considering the spatial configuration of ES flow

The spatial scale at which humans perceive benefits from does not always correspond to the production point of this service. Knowledge of this relationship could help in identifying key areas to set aside for particular service delivery.

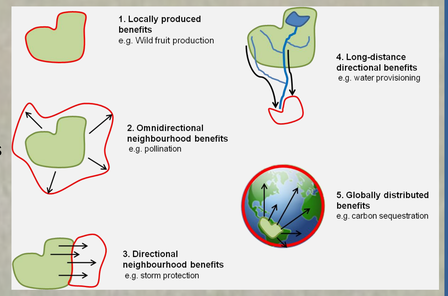


Fig. 3. Spatial scale of ES. From Balmford et al. 2008.

3. Bundles of ES in protected areas

The supply of ES vary according to the land use type. While provisioning and cultural services often demand a certain degree of land use to be supplied, the sum of regulating services are usually higher in natural state ecosystems (de Groot et al. 2010).

Under different land use types, different bundles of ES can be identified (Raudsepp-Hearne et al. 2010).

Protected areas (e.g. IUCN status I to VI) could offer the possibility of safeguarding each type of ES bundle (Cimon-Morin et al. 2012).

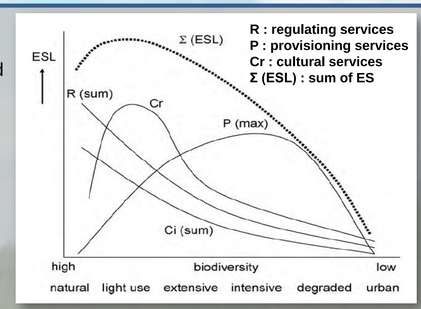


Fig. 4. Relationships between the levels of ES provision (Y-axis) and the degree biodiversity related to different land use intensities (X-axis). From de Groot et al. 2010.

Conclusion

With a human population now above 7 billion inhabitants, remote areas will obviously be under pressure in the next years. Ensuring the sustainable delivery of ES in these areas prior to development will be crucial for human welfare and a unique opportunity for conservation.

References

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