Integrating land use and land cover change simulations and connectivity modeling: a case study in the Monteregie region in southern Quebec

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Dedication

To be completed.

Abstract

Space is a finite resource. How we manage and govern space is a reflection of the trade-offs and choices made by people and organizations at different spatial and temporal scales. Those choices primarily determine and regulate land use: if and how space is organized and whether resources are exploited, transformed or conserved. Ecological connectivity, defined as the extent to which the landscape supports the movements of organisms, can be strongly affected by land use. It is an important component of the resilience of populations in heterogeneous and fragmented landscapes. Land use changes such as urban sprawl and agricultural intensification intensify habitat fragmentation and landscape homogenization, leading to the erosion of ecological connectivity. The Monteregie region in southern Quebec, where this work takes place, is experiencing urban growth and sprawl. We present a framework that integrates land-use change and connectivity modeling to forecast future changes in connectivity, using a combination of statistical modeling, MCMC-based simulations, and circuit theory. Models trained on past land use data were used to project future land use changes using different scenarios, and estimate future changes in functional connectivity for 5 different umbrella species. We contrast the past and future impacts of trends in land use (i.e.urbanization, agricultural expansion, and deforestation) and derive conservation priorities for the design of a local network of connected protected areas resilient to future landscape change. We demonstrate the flexibility of a scenario approach in forecasting the range of possible futures for ecological connectivity in the region and show that taking probable landscape changes into account lead to different conservation priorities. We conclude on the importance of considering such changes to produce a resilient network of protected areas and highlight the need for a multi stakeholder approach in the definition of scenarios and conservation priorities.

Abrégé

To be completed.

Acknowledgements

To be completed.

Contribution of Authors

I am the first author for all chapters and the appendix in this thesis.

Chapter 1: I wrote the manuscript with input from my supervisor.

Chapter 2: I wrote the manuscript with input from my supervisor.

List of Figures

List of Tables

General Introduction

To be completed. [1]

CHAPTER 1
My first chapter

Valentin Lucet[1], Andrew Gonzalez[1]

Author Affiliations:

[1]Department of Biology, McGill University

1.1 Abstract

To be completed.

1.2 Introduction

Nunc sed pede. Praesent vitae lectus. Praesent neque justo, vehicula eget, interdum id, facilisis et, nibh. Phasellus at purus et libero lacinia dictum. Fusce aliquet. Nulla eu ante placerat leo semper dictum. Mauris metus. Curabitur lobortis. Curabitur sollicitudin hendrerit nunc. Donec ultrices lacus id ipsum.

1.3 Methods

Study Site

To be completed.

Sampling

To be completed.

Analyses

To be completed.

1.4 Results

To be completed. (Fig. 1–1).

1.5 Discussion

Nunc sed pede. Praesent vitae lectus. Praesent neque justo, vehicula eget, interdum id, facilisis et, nibh. Phasellus at purus et libero lacinia dictum. Fusce aliquet. Nulla eu ante placerat leo semper dictum. Mauris metus. Curabitur lobortis. Curabitur sollicitudin hendrerit nunc. Donec ultrices lacus id ipsum.

Figures & Tables

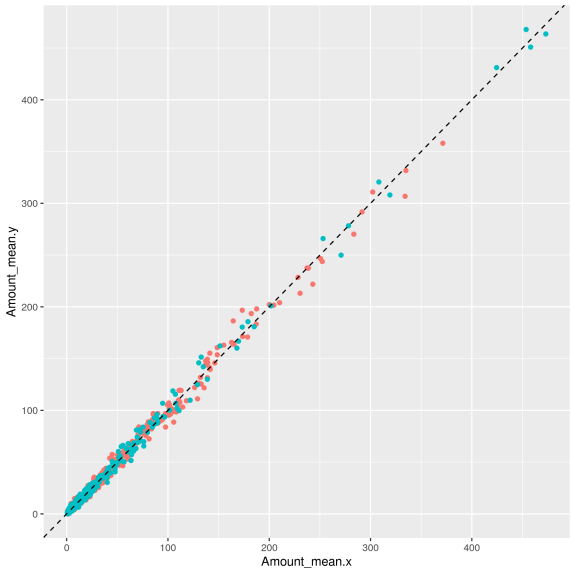

Figure 1–1: Figure 1

Site	Weeks	S	XS	Daily	A/B	Total
Nhlanguleni (NHL)	3	0	0	0	Yes	6
Nwaswitshaka (NWA)	3	1	1	4	Yes	18
De LaPorte (DLP)	1	1	1	0	Yes	6
Kwaggas Pan (KWA)	2	1	1	0	Yes	8
Girivana (GIR)	3	0	0	0	Yes	6
Witpens (WIT)	3	0	0	0	Yes	6
Imbali (IMB)	3	0	0	0	Yes	6
Hoyo Hoyo (HOY)	3	1	1	0	Yes	10
Nyamarhi (NYA)	3	1	1	0	Yes	10
Ngosto North (NGO)	3	1	1	0	Yes	10
BLANK	2	0	0	0	No	2
	29	6	6	4		88

Table 1–1: Table 1.

Linking Statement 1

In Chapter I, I did this, in Chapter II I did that.

CHAPTER 2
My Second chapter

A. Student[1], B. Supervisor[1]

Author Affiliations:

[1]Department of Biology, McGill University

2.1 Abstract

Nunc sed pede. Praesent vitae lectus. Praesent neque justo, vehicula eget, interdum id, facilisis et, nibh. Phasellus at purus et libero lacinia dictum. Fusce aliquet. Nulla eu ante placerat leo semper dictum. Mauris metus. Curabitur lobortis. Curabitur sollicitudin hendrerit nunc. Donec ultrices lacus id ipsum.

2.2 Introduction

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2.3 Methods

Study Site

Nunc sed pede. Praesent vitae lectus. Praesent neque justo, vehicula eget, interdum id, facilisis et, nibh. Phasellus at purus et libero lacinia dictum. Fusce aliquet. Nulla eu ante placerat leo semper dictum. Mauris metus. Curabitur lobortis. Curabitur sollicitudin hendrerit nunc. Donec ultrices lacus id ipsum.

Sampling

Nunc sed pede. Praesent vitae lectus. Praesent neque justo, vehicula eget, interdum id, facilisis et, nibh. Phasellus at purus et libero lacinia dictum. Fusce aliquet. Nulla eu ante placerat leo semper dictum. Mauris metus. Curabitur lobortis. Curabitur sollicitudin hendrerit nunc. Donec ultrices lacus id ipsum.

Analyses

Nunc sed pede. Praesent vitae lectus. Praesent neque justo, vehicula eget, interdum id, facilisis et, nibh. Phasellus at purus et libero lacinia dictum. Fusce aliquet. Nulla eu ante placerat leo semper dictum. Mauris metus. Curabitur lobortis. Curabitur sollicitudin hendrerit nunc. Donec ultrices lacus id ipsum.

2.4 Results

Nunc sed pede. Praesent vitae lectus. Praesent neque justo, vehicula eget, interdum id, facilisis et, nibh. Phasellus at purus et libero lacinia dictum. Fusce aliquet. Nulla eu ante placerat leo semper dictum. Mauris metus. Curabitur lobortis. Curabitur sollicitudin hendrerit nunc. Donec ultrices lacus id ipsum.

2.5 Discussion

Nunc sed pede. Praesent vitae lectus. Praesent neque justo, vehicula eget, interdum id, facilisis et, nibh. Phasellus at purus et libero lacinia dictum. Fusce aliquet. Nulla eu ante placerat leo semper dictum. Mauris metus. Curabitur lobortis. Curabitur sollicitudin hendrerit nunc. Donec ultrices lacus id ipsum.

Figures & Tables

General Discussion & Conclusion

To be completed.

Appendix

2.6 Chapter I Supplementary Data and Results

Table 2–1: Sup Table 2

Sample code	Site	Date	Temp (°C)	mS/cm	DO (%)	DO (mg/L)	pH
DLP_8	DLP	July 10	15.27	3.11	83.37	39.67	9.16
GIR_1	GIR	June 24	18.58	1.95	50.83	42.00	9.27
GIR_2	GIR	July 1	21.85	1.80	74.47	41.00	9.24
GIR_3	GIR	July 8	20.72	1.90	88.47	39.00	9.35
HOY_2	HOY	June 22	17.59	3.18	14.53	43.43	8.14
HOY_3	HOY	June 29	17.84	3.01	42.53	40.00	8.25
HOY_4	HOY	July 6	16.83	2.96	39.27	35.90	8.39
IMB_2	IMB	June 22	15.17	2.46	74.80	46.77	8.19

References

[1] Roy G Bengis and J. M Erasmus. Wildlife diseases in South Africa: a review. *Revue scientifique et technique (OIE)*, 7(4):807–821, 1988.