Comparative analysis of forest tenure modes: effects on forest structure

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This presentation focuses on preliminary results from the first chapter of my thesis entitled: « Comparative analysis of forest tenure modes using environmental and socio-economic indicators of sustainable forest management »

Forests…

- Provide environmental services
  - Regulation of climate, water and carbon cycles…
  - Biodiversity
- Perceived as a common resource by humans
- Timber harvesting
  - Provides leverage for the economy
  - Increasing pressure on forest ecosystems
  - Concerns about its long term sustainability
- Tragedy of the commons (Hardin 1968)
  - Common pool resources overexploited without privatization or government control.
  - Many reactions and critics, but no solution… (Dietz et al. 2003)

Forests provide many environmental services to humanity, and therefore are perceived as common resources. But their exploitation, although it levered our economy, is a threat to the quality and quantity of environmental services provided.

This conflict recalls the tragedy of the commons, which states that Common pool resources will be overexploited without privatization or government control.

To address this issue in the context of forests, we need a benchmark upon which we can compare forests and their management

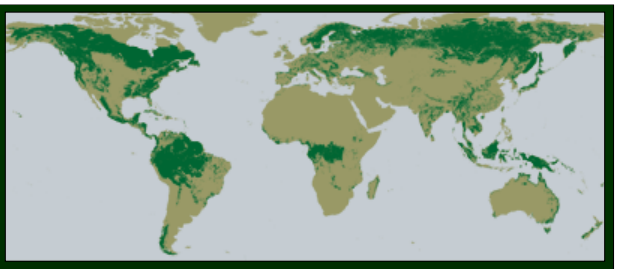
Sustainable Forest Management

- **Three groups of SFM indicators** (Kneeshaw et al. 2000):
  - Environmental:
    - Biodiversity (age structure, composition of stands)
    - Regeneration
    - Spatial distribution and configuration of forest stands
  - Social
    - Values attributed by people (recreation, landscape)
  - Economic
    - Employment
    - Economic fluxes

Sustainable forest management indicators are affected by forest management practices, which depend on the tenure of the land.

Forest tenure

- Two main types, according to ownership
  - Private
  - Public
- Distribution
  - Historically almost entirely public
  - Worldwide (81% public, 19% private ↑)
  - Sample of developed countries
- Economic analysis consider privatisation as the solution to the tragedy of the commons, normal evolution of organisation in forested countries (Desrochers 2002)
- Calls for reflection on the potential effects of tenure change



Country	Public	Private	Communal
France	10%	74%	16%
Switzerland	1%	57%	42%
United Kingdom	44%	56%	
Sweden	5%	87%	8%
Finland	34%	61%	5%
United States	45%	55%	

Source: (Angers 2003)

There are two main types of forest tenure: private and public.

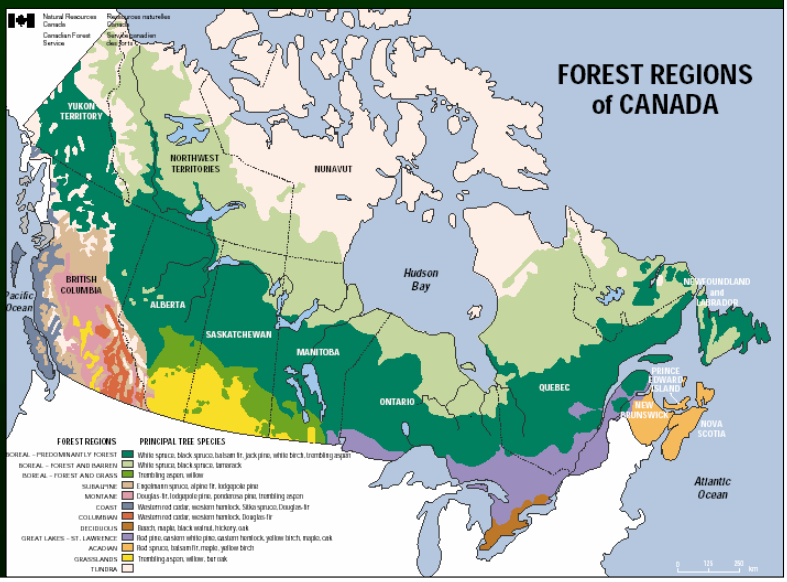
Historically, forests were almost all public, but an increasing proportion is now private. And if we take a sample of developed countries that also have a large forest industry like Canada, we see that the proportion of private forest is significant.

This trend brings some economists, namely from the Montreal Economic Institute, to say that privatization is the solution to the tragedy of the commons, some kind of normal evolution of the organization in forested countries.

But we first need to consider the potential effects of this change in forest tenure.

Forest tenure

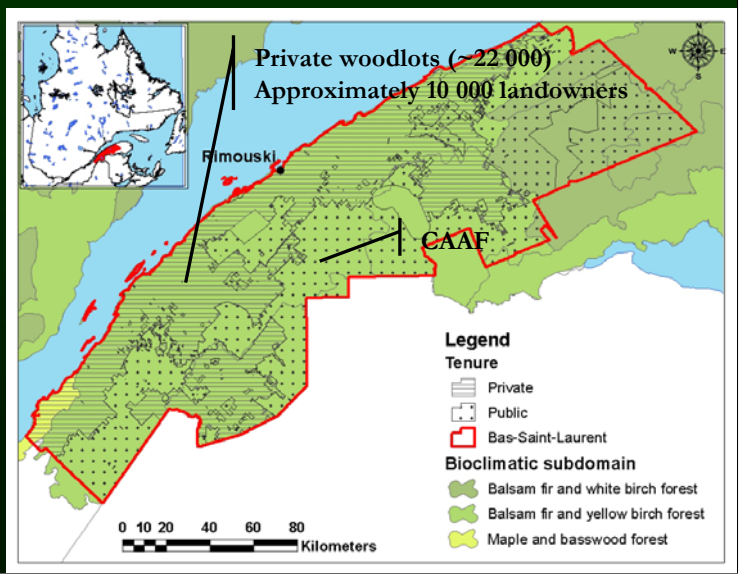
- Canada:
  - 94% public
- Québec
  - 89% public



Forest tenure in Canada, and in the province of Quebec

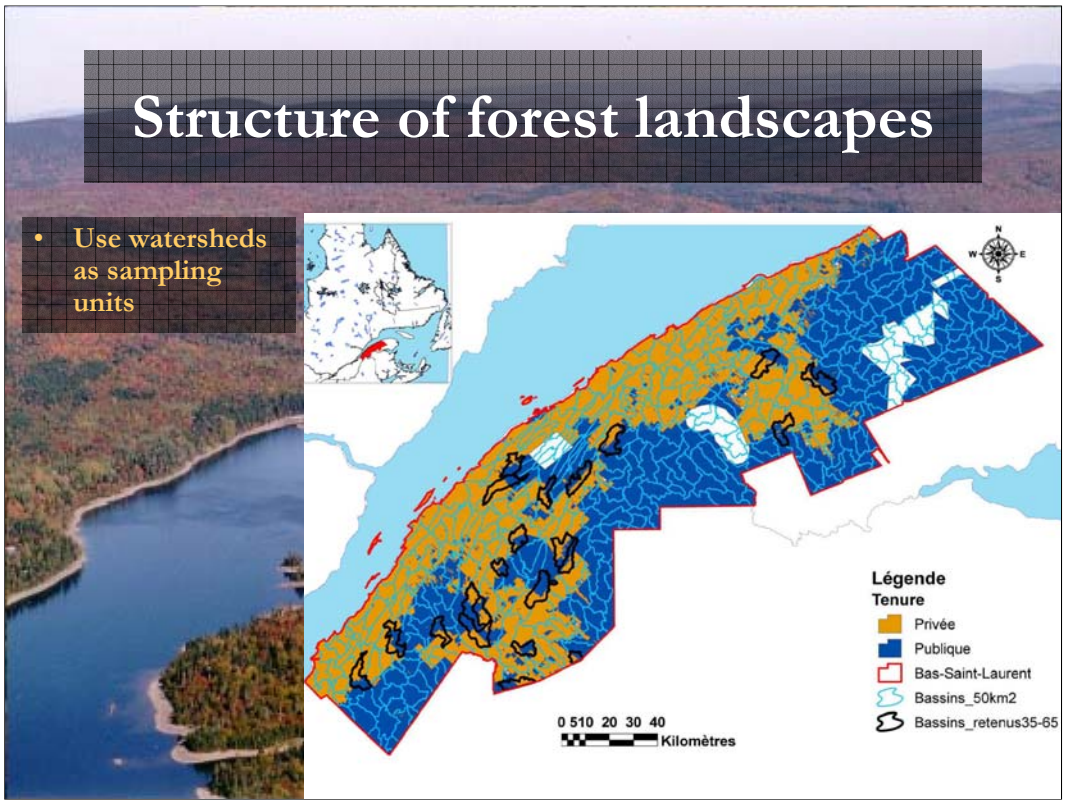
Bas-Saint-Laurent

- 51% public, 49% private
- Mostly within the same ecological region
- Allows for a comparison between the two tenures to understand their respective influence on:
  - Environment (forest landscape)
  - Society
  - Economy



Bas-Saint Laurent, is a unique region in Canada because its forest is equally distributed under each tenure.

The 4 objectives of my thesis, but here we will discuss the first one.



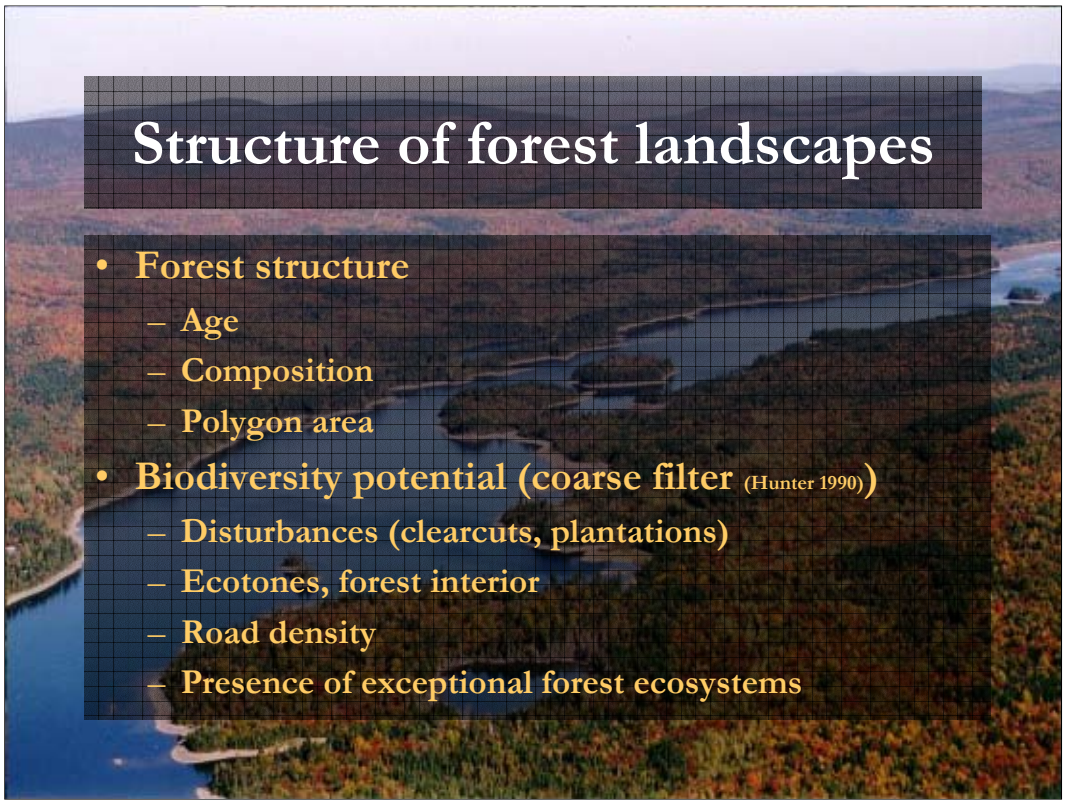
To study the structure of landscapes, I used watersheds as sampling units.

First, I divided the land base into approximately 50 km2 water basins.

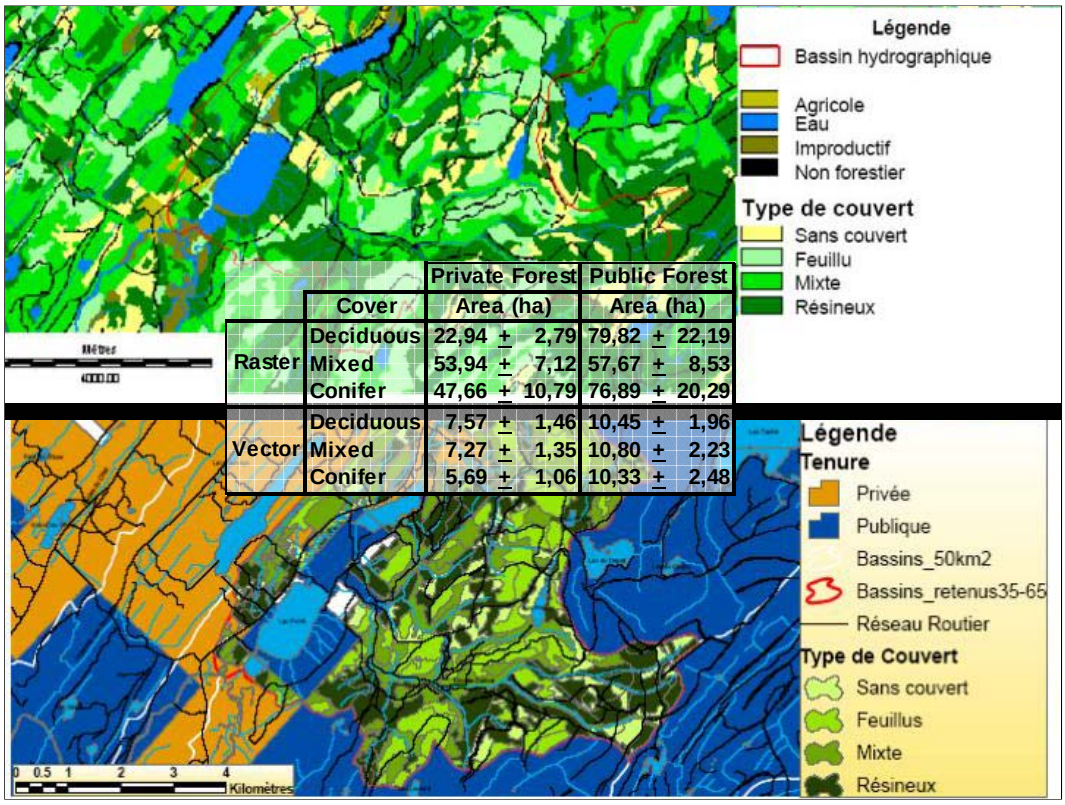
Then, proportion of each basin under each tenure.

Select those that had both, and were 35-65% under each tenure, which gives a total of 22 watersheds.

So I’m working at the interface of both tenures, which is easier since comparing a 100% private basin bear the St. Lawrence with one 100% public in the highlands is problematic because biophysical variables are not comparable.



Here are the indicators used to compare the forest structure.

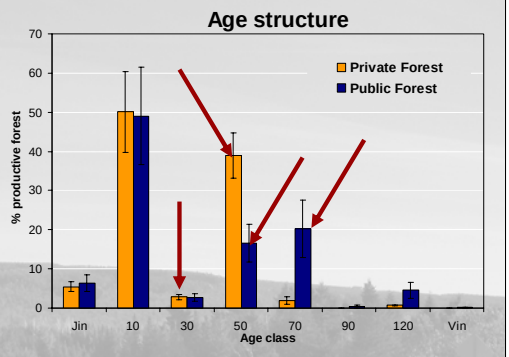


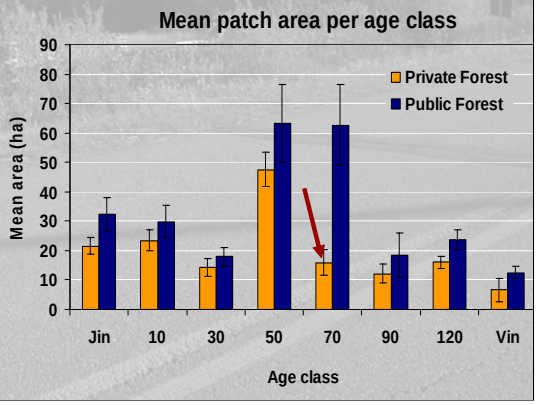
	Cover	Private Forest Area (ha)	Public Forest Area (ha)
Raster	Deciduous	22,94 ± 2,79	79,82 ± 22,19
	Mixed	53,94 ± 7,12	57,67 ± 8,53
	Conifer	47,66 ± 10,79	76,89 ± 20,29
Vector	Deciduous	7,57 ± 1,46	10,45 ± 1,96
	Mixed	7,27 ± 1,35	10,80 ± 2,23
	Conifer	5,69 ± 1,06	10,33 ± 2,48

I used raster (matrix) maps for my analyses, because vector maps carry artificial boundaries between forest patches of same age or cover. These boundaries bias the results, for example here in the case of mean patch size with respect to cover.

Age

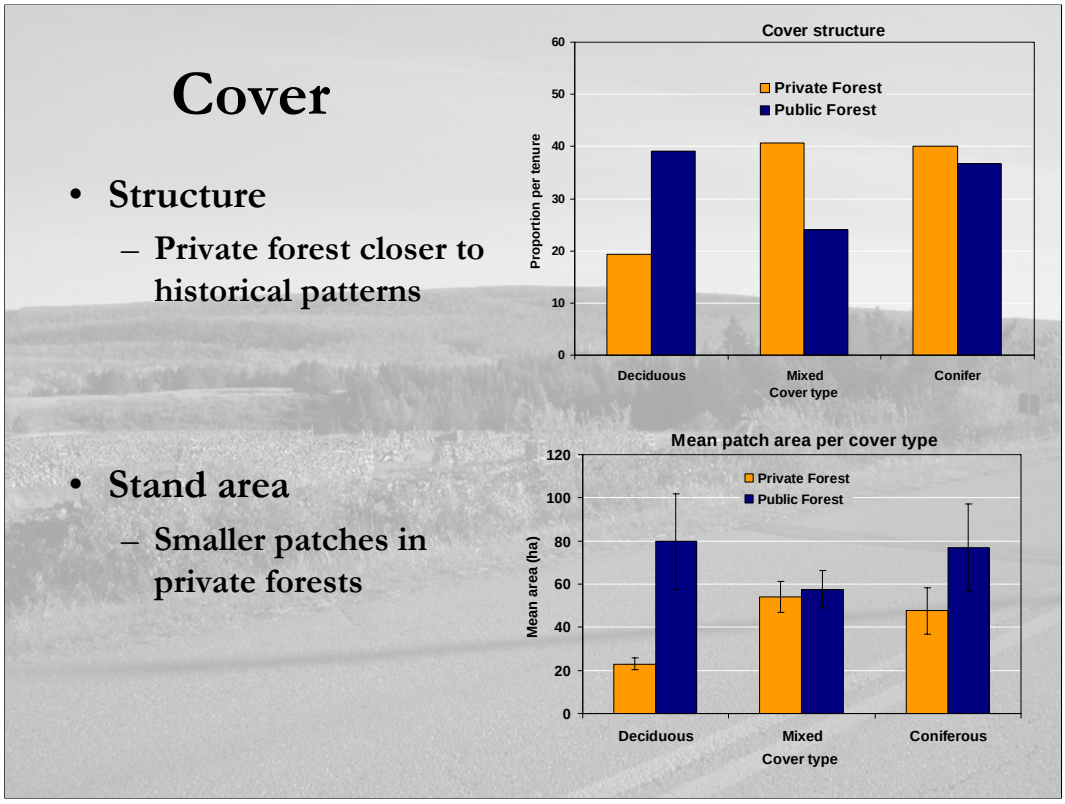
- Structure
  - Anticipated stock rupture
  - More older stands in public
- Patch area
  - Consistently smaller patches in private forests
  - Especially 70 years old





When looking at age structure, the first thing that strikes us is the hole in the stock of growing forest. It is mostly due to the last insect outbreak, which was responded to by massive salvage cuts to recuperate the timber before it rotted. Note that the increased transformation capacity was never brought back in equilibrium with forest annual growth.

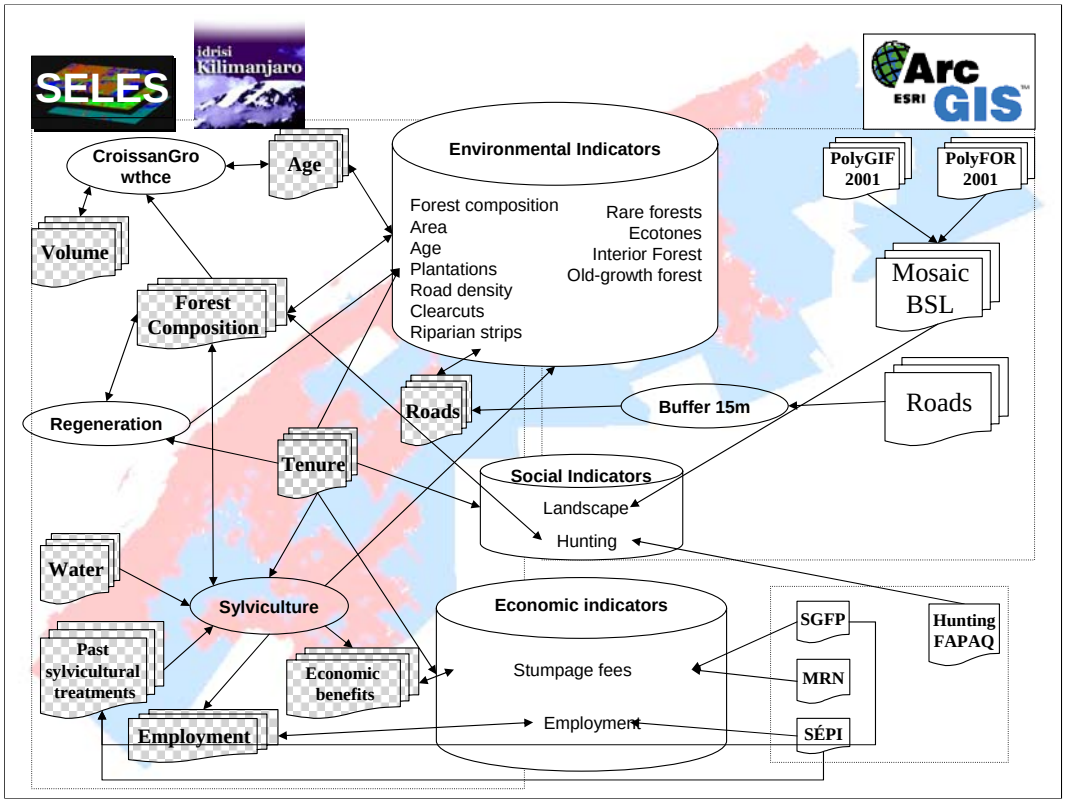
About patch area, the fact that they are consistently smaller than patches in the public forest might seem obvious to many of us: the machinery used is larger, woodlots are smaller management units that somewhat restrict vast cutting operations. Note however , that the method used here removed the administrative, « imaginary » boundaries of those lots, so they potentially could have reached larger patch size. Road density, which I did take into account, might also be contribute to the explanation , although I cannot show you figures today.



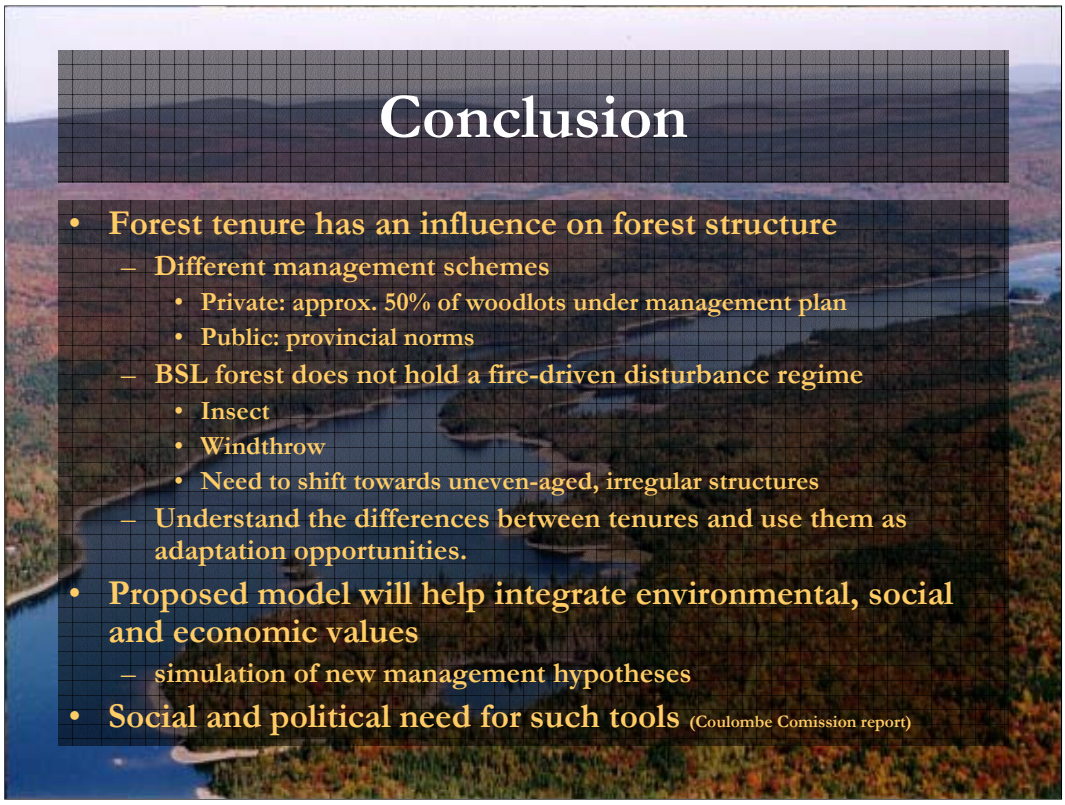
The structure of the cover differs between the tenures, where private forests are les deciduous in composition. This resembles the historical patterns found by my colleague Y. Boucher (Ph.D thesis in preparation), but need more investigation to find the cause of this difference. I will analyze some more data in this direction.

Consistently with the stand size by age class, the stand size by cover type is smaller in the private forests.

Next, I will analyze sylvicultural practices, to better understand how the forest structures have become different.



Here is a conceptual representation of the model I propose to build for my last chapter, in an effort to integrate all aspects of my results.



In conclusion, we have seen that forest tenure has an influence on forest structure. The two existing management schemes contribute to this influence, and I need to further analyze other data to understand their respective contribution to this trend.

The BSL region has a disturbance regime that is not well mimicked by most of the current practices, which is why we need to reorient sylvicultural operations towards the restoration of an uneven-aged and irregular structure.

With the results from the first chapters incorporated into the proposed model, we will be able to better understand the implications of actual and hypothetical management scenarios for environmental, economic and social values associated with forests.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