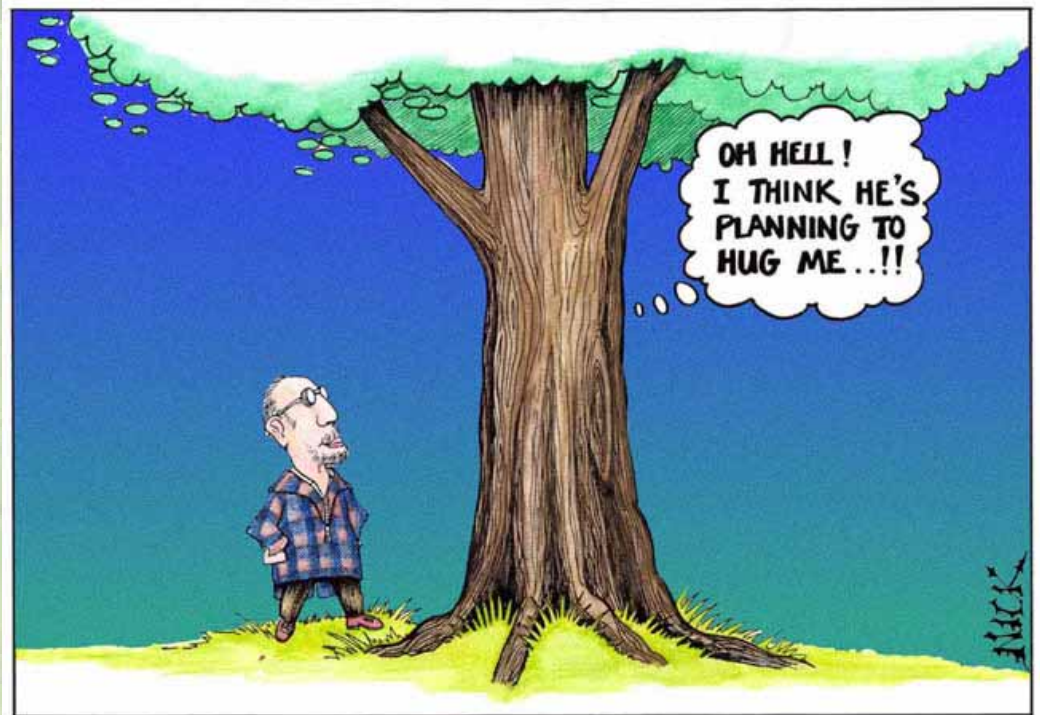


Potential supply of biomass for bioenergy from Canada's forests

C.C. Dymond, B.D. Titus, G. Stinson and W.A. Kurz

Outline

- Why?
- What do we know about the future?
- What don't we know?
- Is wood-based bioenergy a good idea?



Consider the trees. They have no legs to run with.

Why forest biomass for bioenergy?

- Finite supply of fossil fuels
- Renewable resource
- Energy security
- Alternative income stream for forest industry
- Reduce greenhouse gas emissions
 - Harvest residue currently piled and burned, could be used for energy instead

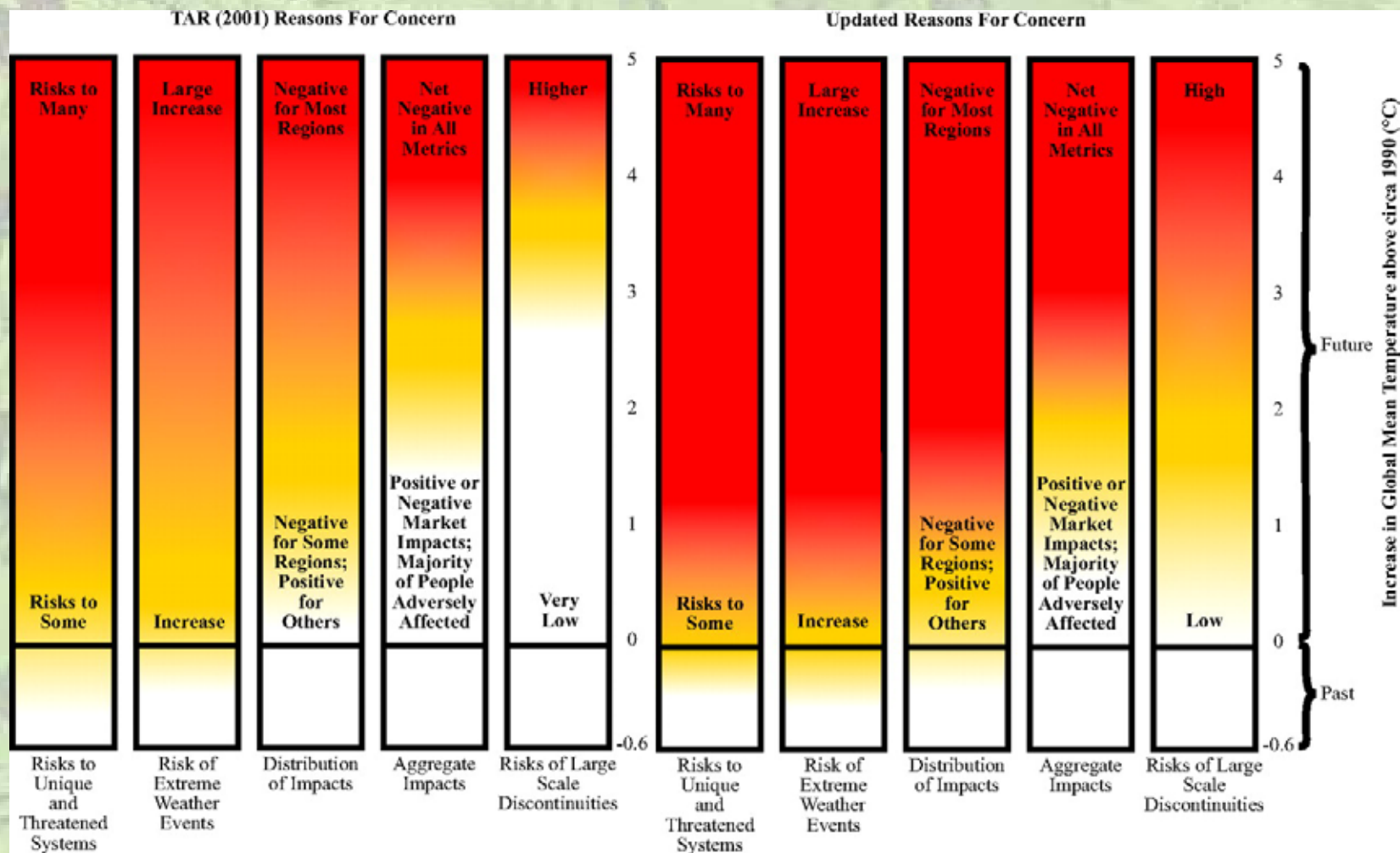
Slash burning in Lakes TSA



Photo credit: E. Harvard



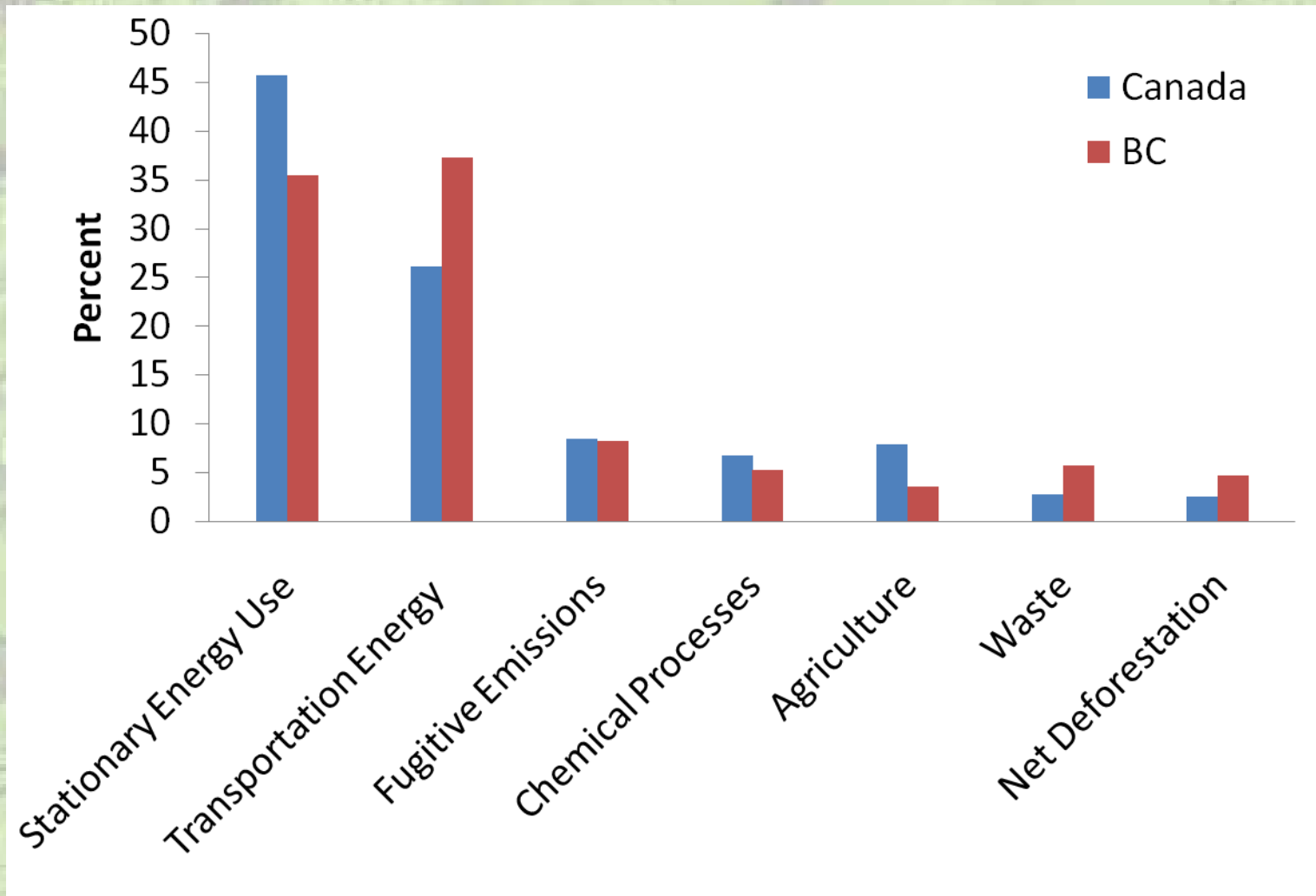
Risks from climate change, by reason for concern—2001 compared with updated data



Smith J. B. et.al. PNAS 2009;106:4133-4137

Sources of GHG emissions in Canada or BC

* As used for mitigation targets



Forestry-related opportunities to reduce net emissions

1. Increase (or maintain) forest area
2. Increase stand-level carbon density
3. Increase landscape-level carbon density
4. Increase C stored in wood products,
5. Reduce fossil emissions
 - More efficient operations
 - Bioenergy use of waste wood and,
 - Product substitution.

Why estimate future feedstock supply?

- Develop evidence-based policies at the national, provincial, regional levels
- ~~Business planning~~
- Cool new science

The results in this study are not location-specific enough for business planning

Businesses likely to do own inventory as part of business-planning process

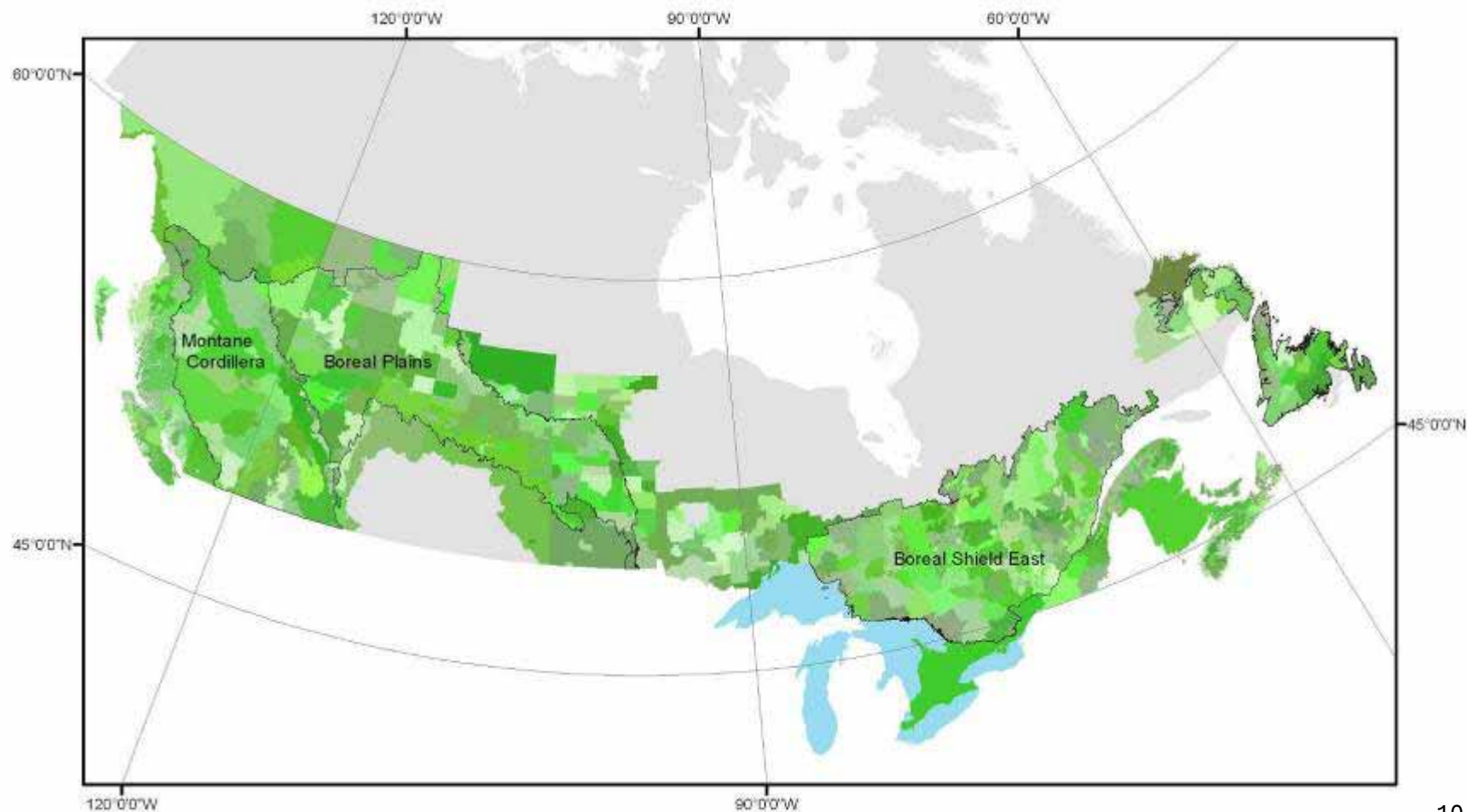
Study description

- Simulate future forest growth and mortality for most of Canada's forests
- Include harvest and natural disturbances
- Use a stochastic approach to project 100 different possible futures for annual area burned
- Estimate harvest residues
- Estimate deadwood resulting from insects and fires
- Reduce estimates by 50% & foliage for ecological site requirements.

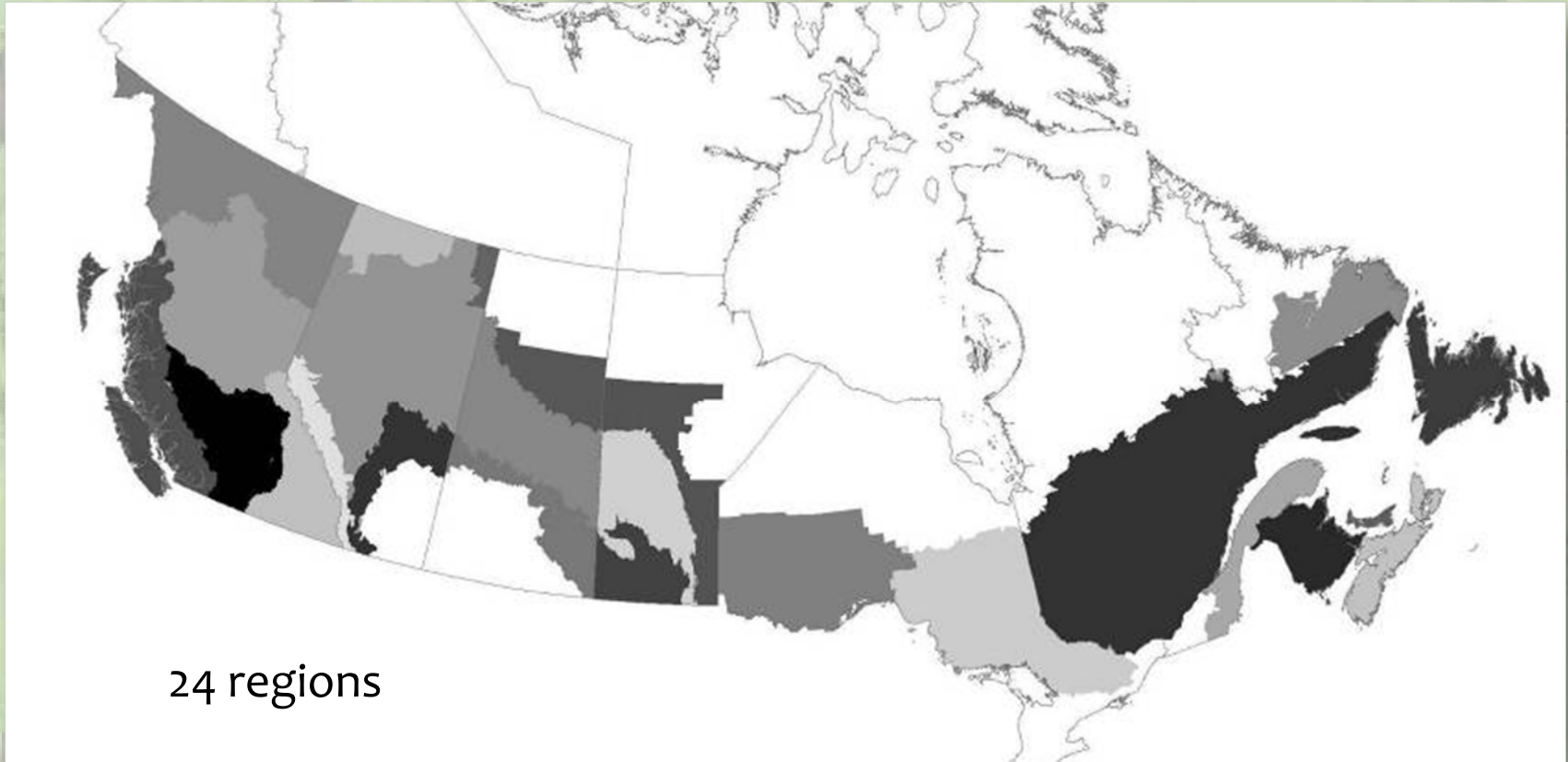


Study area

- 221 million ha,
- 503 spatial analysis units,
- millions of inventory records

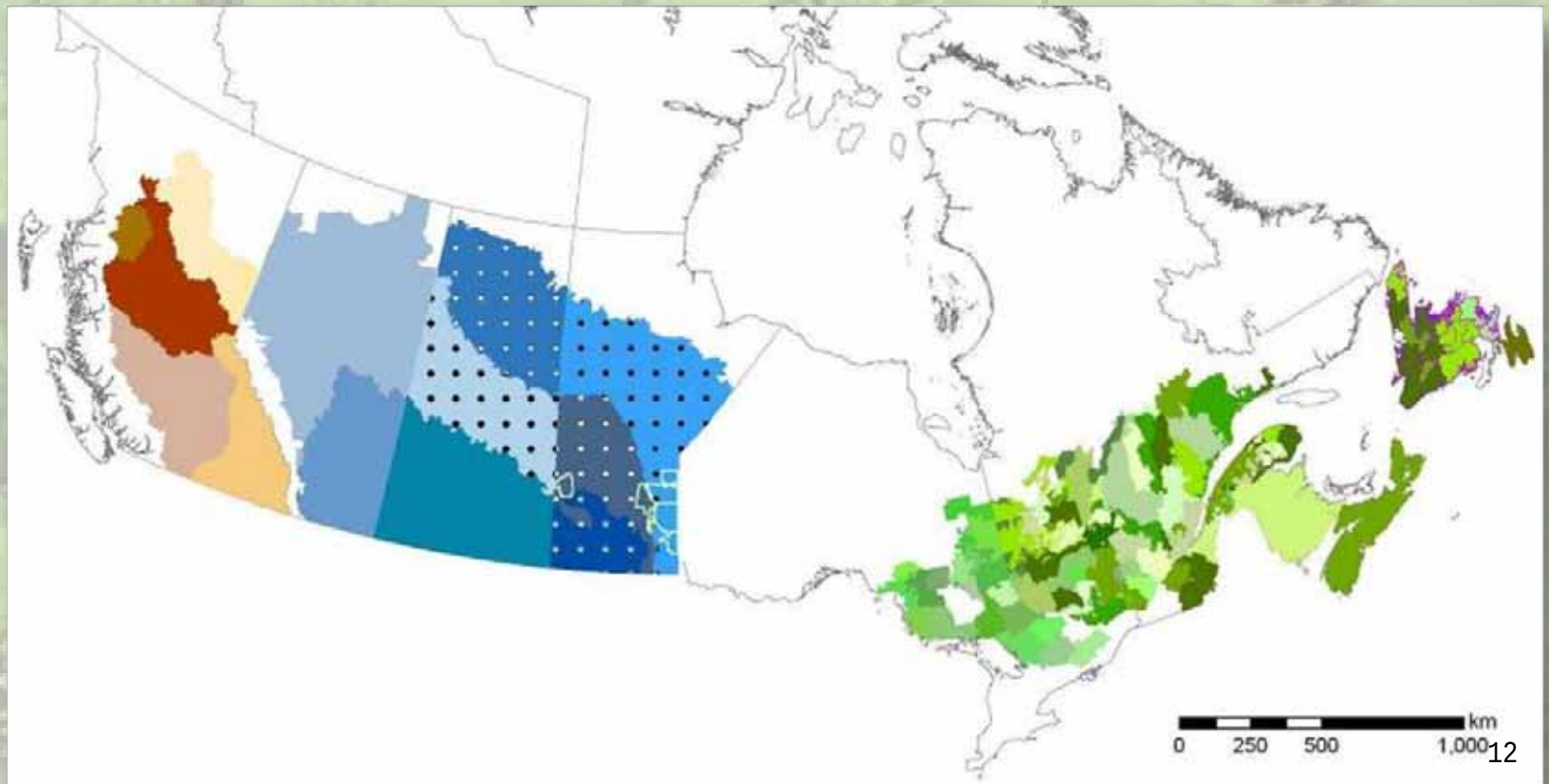


Crown Fire modelling

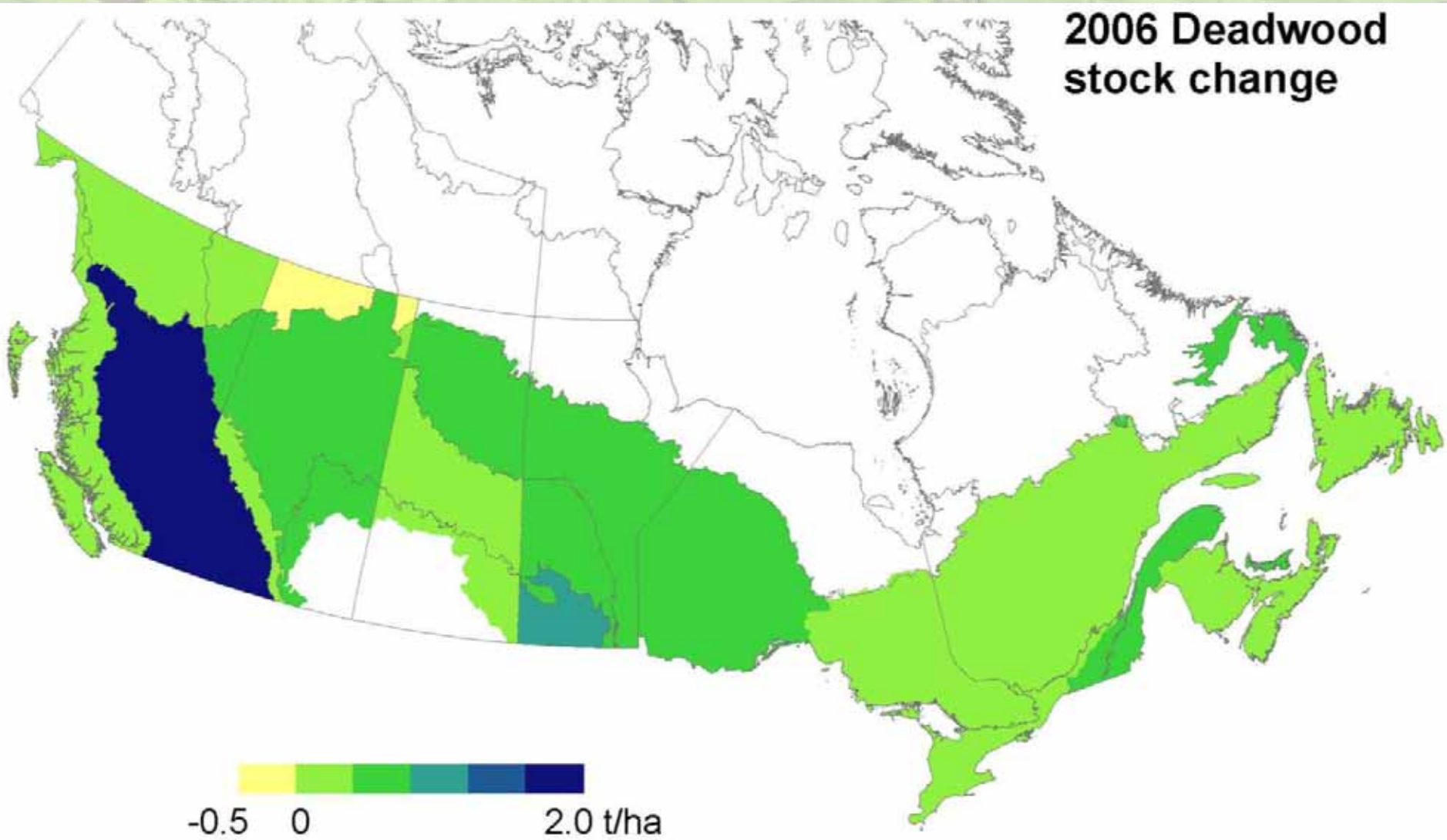


Insect modelling

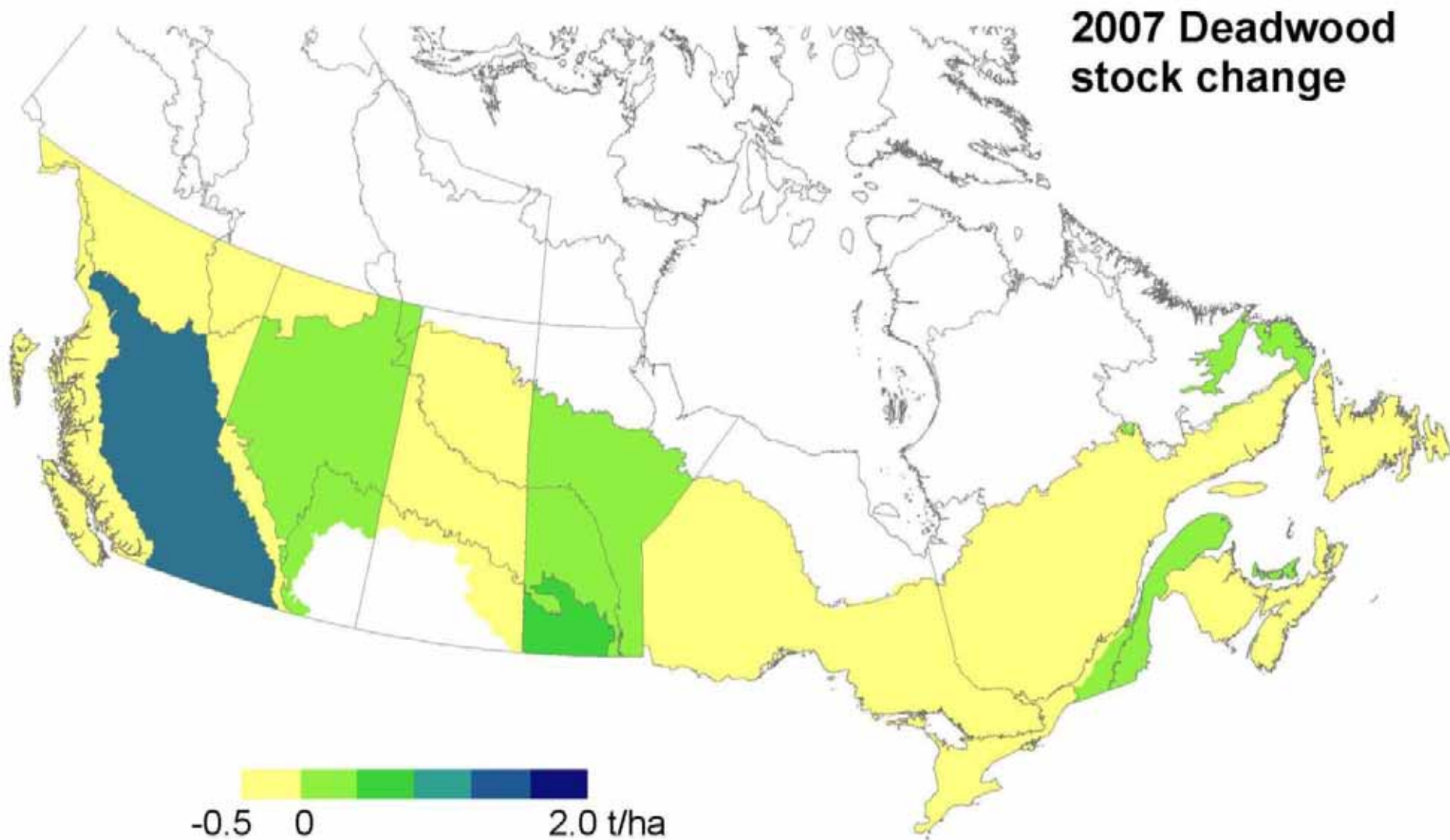
- Mountain pine beetle (brown regions)
- Eastern spruce budworm (green regions)
- Aspen defoliators (blue regions)
- Western jack pine budworm (symbols)
- Hemlock looper (purple outlines)



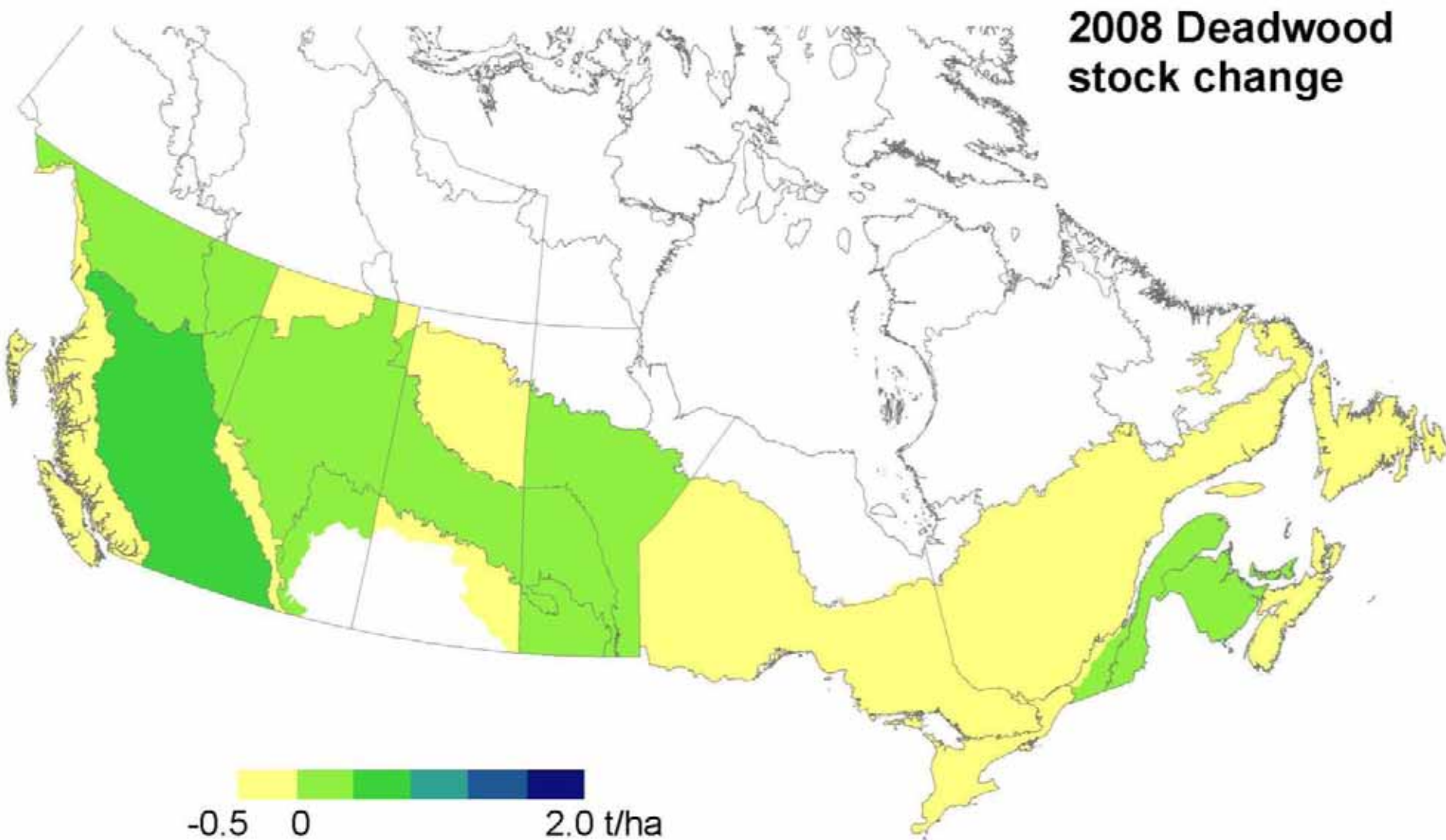
RESULTS



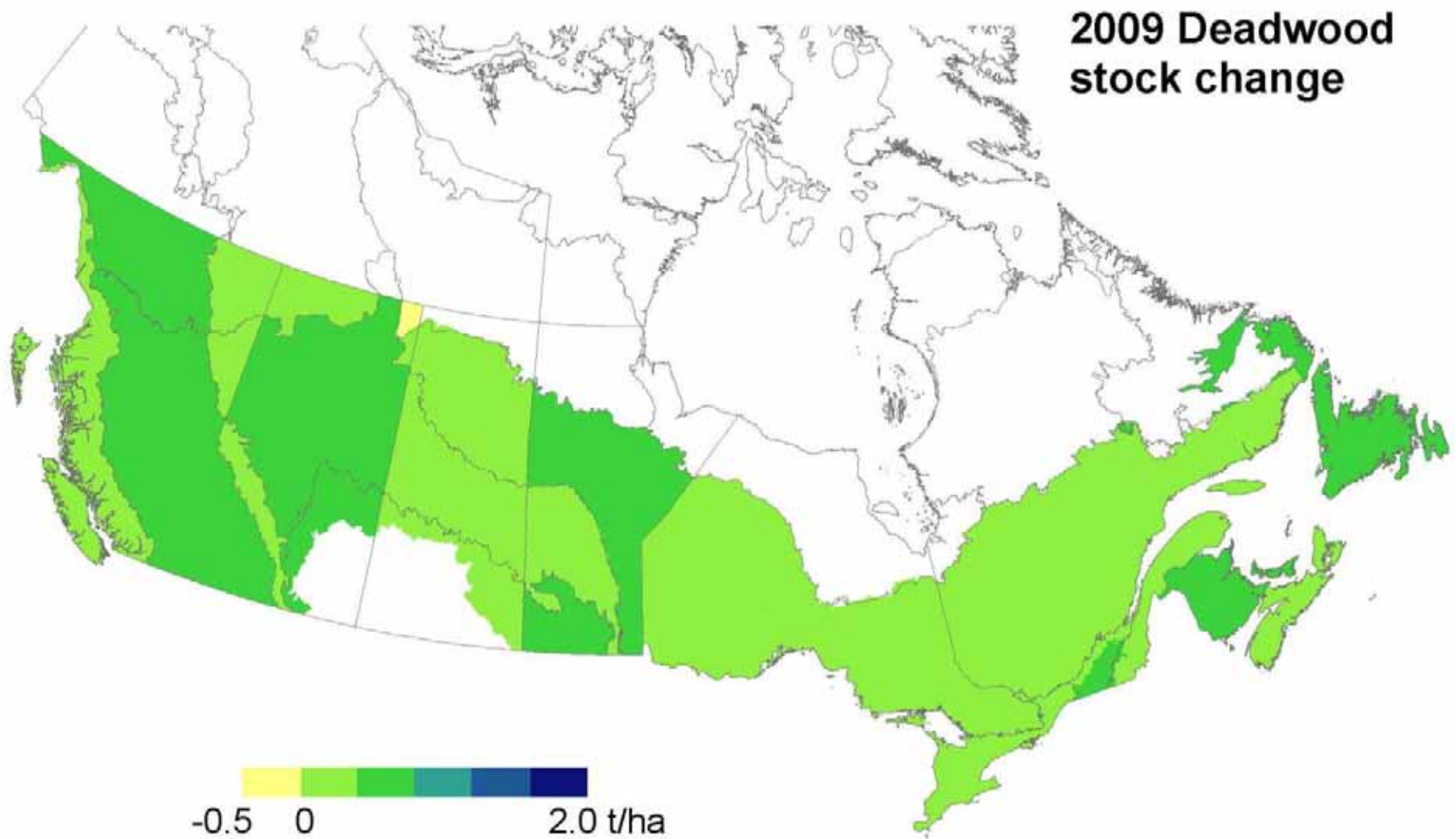
RESULTS



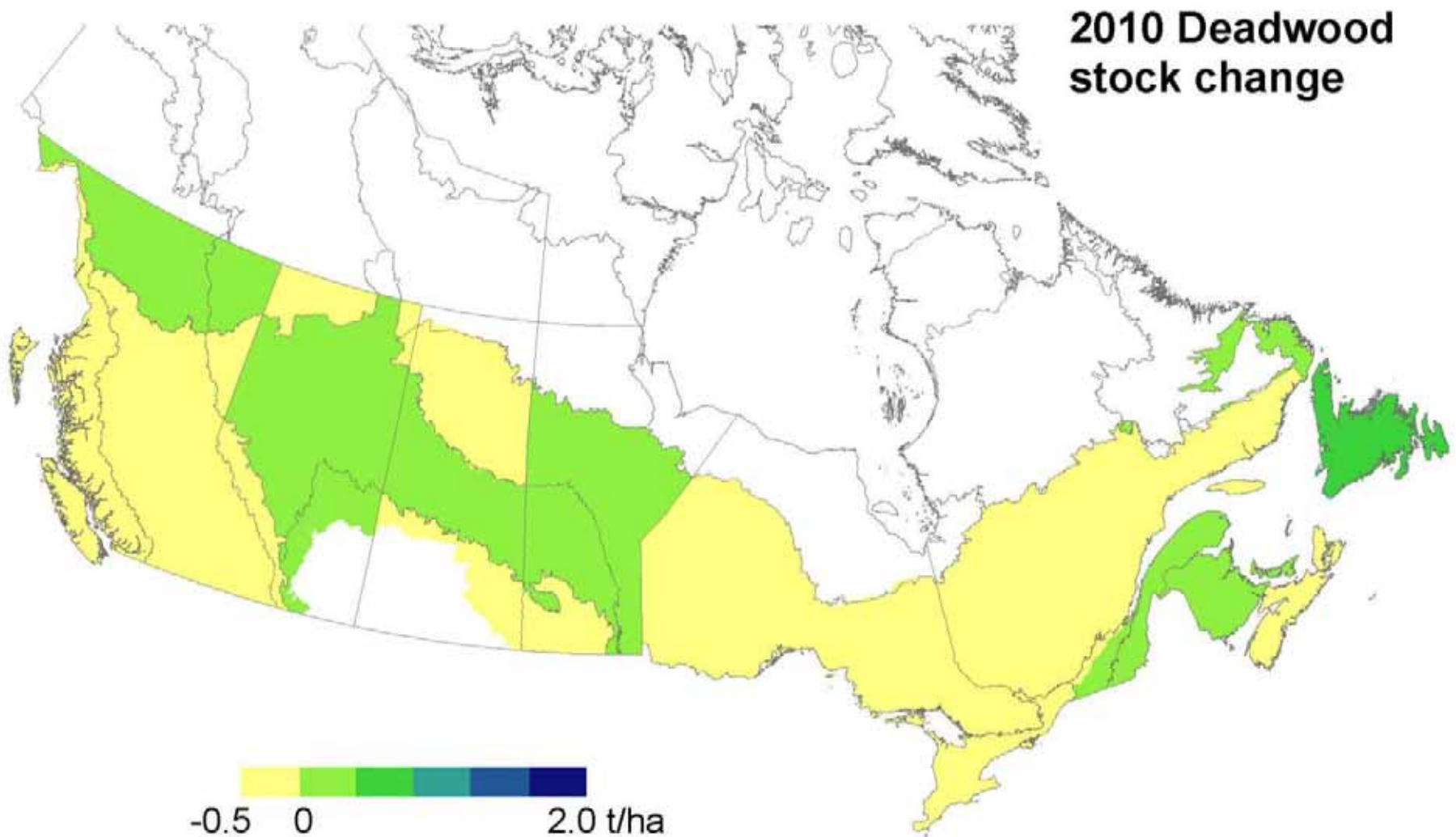
RESULTS



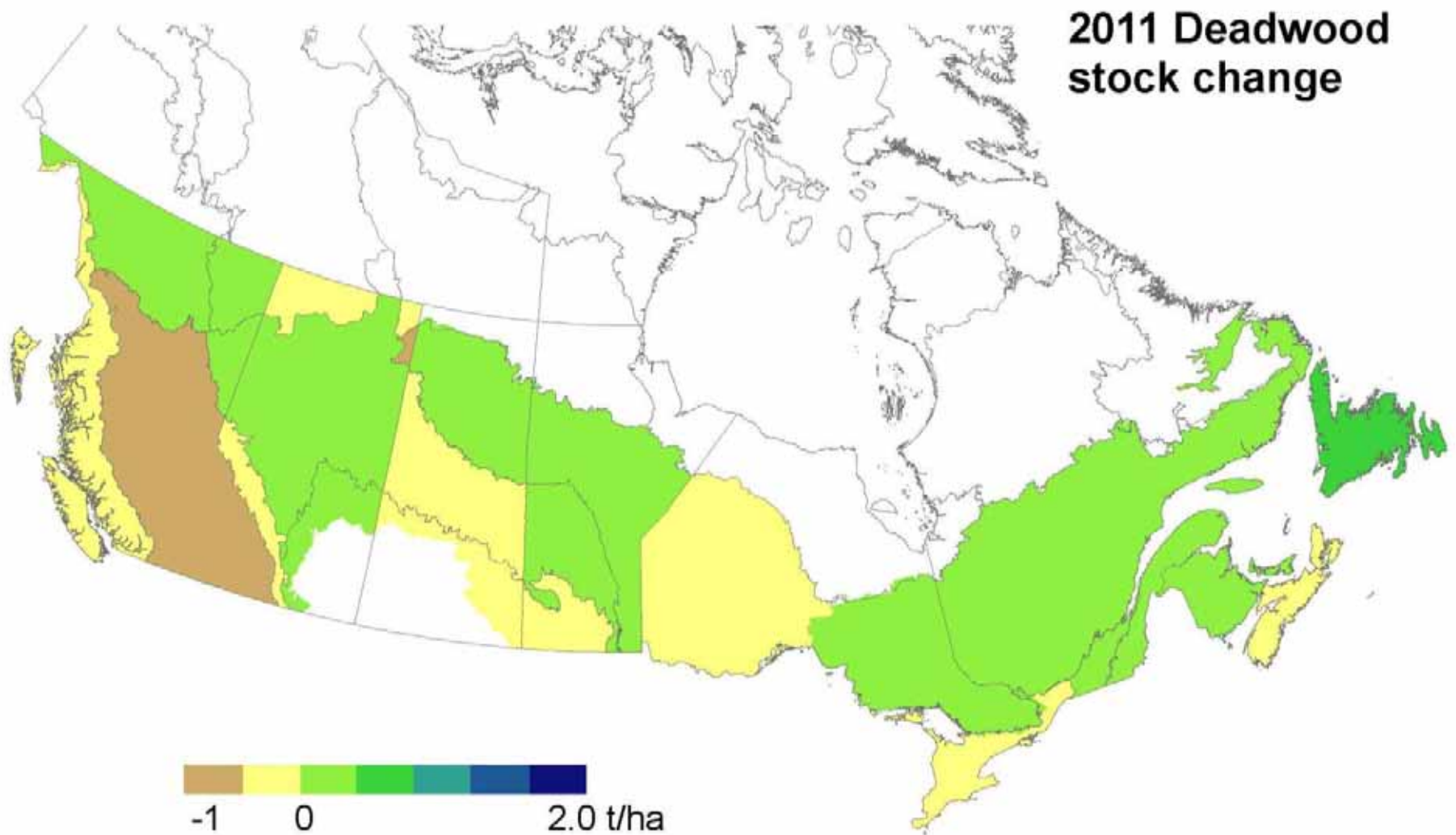
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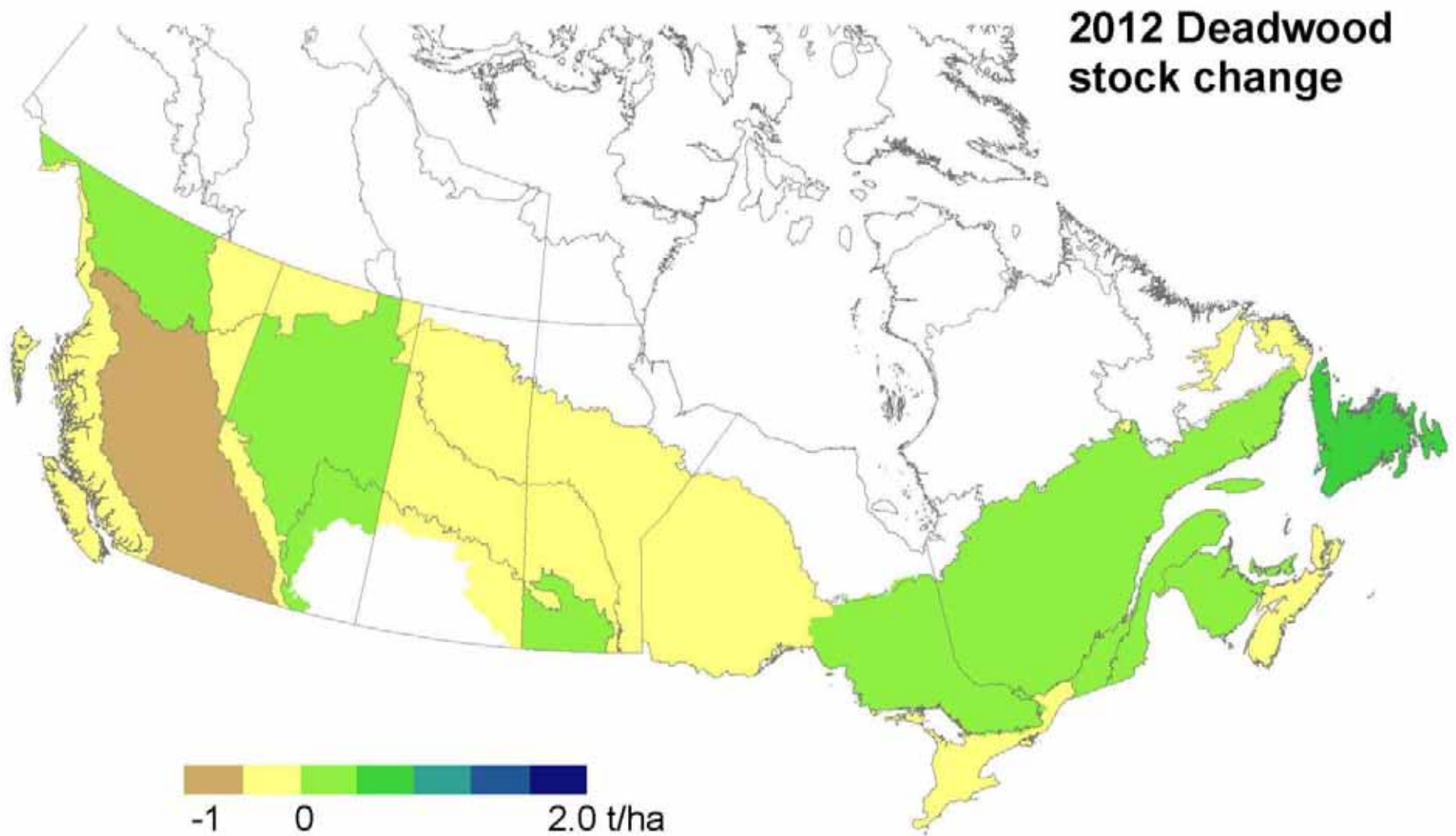
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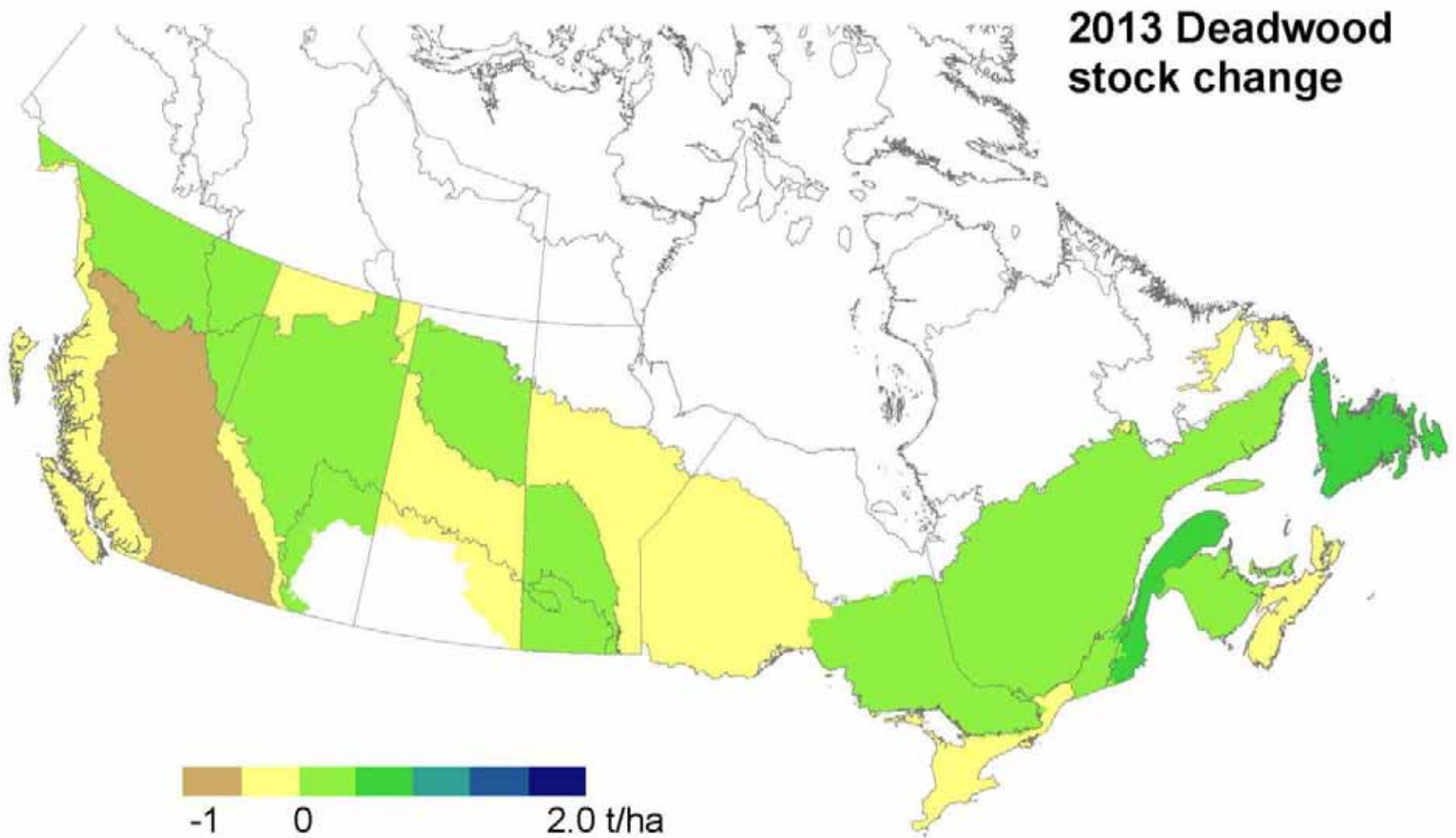
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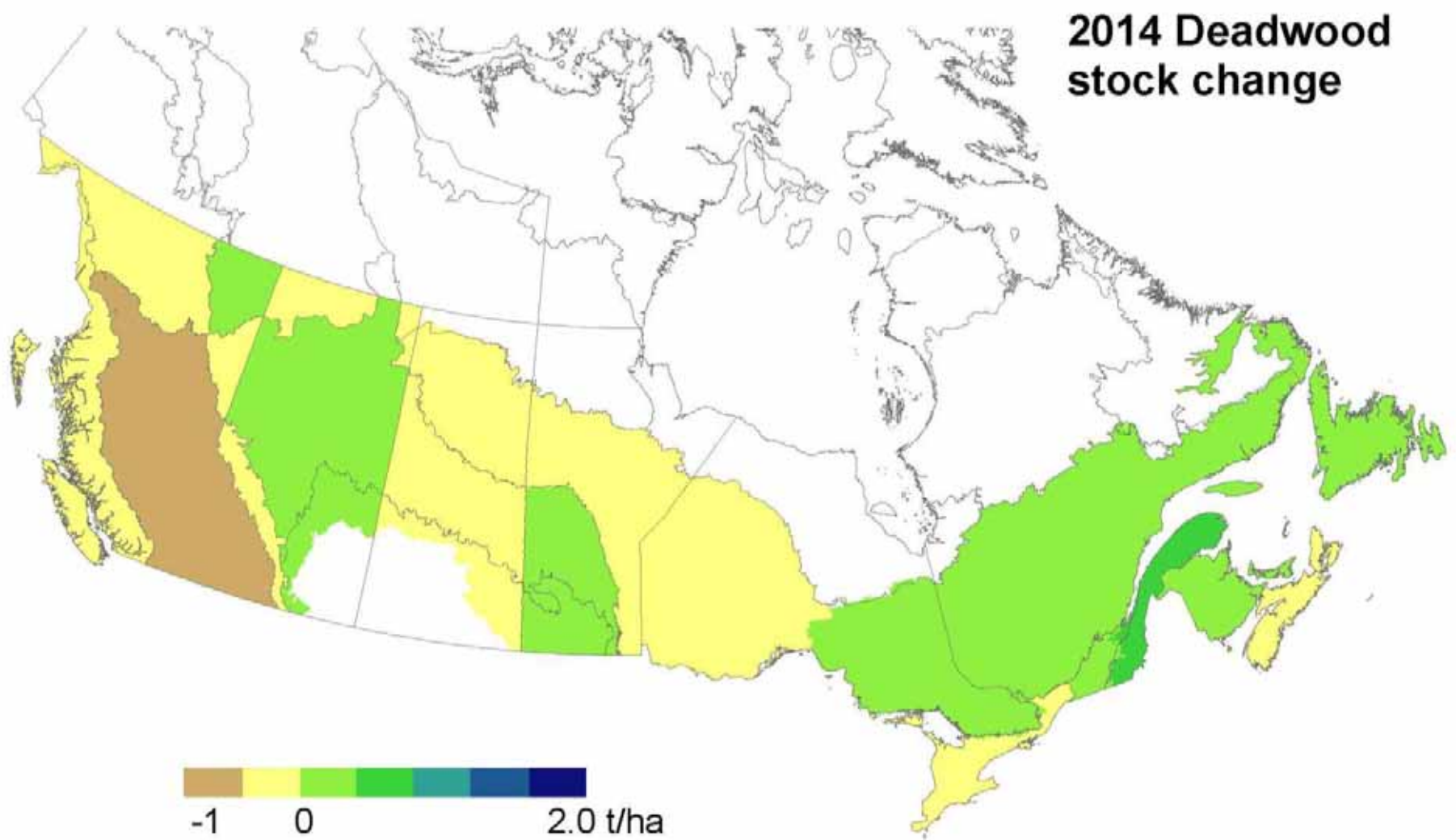
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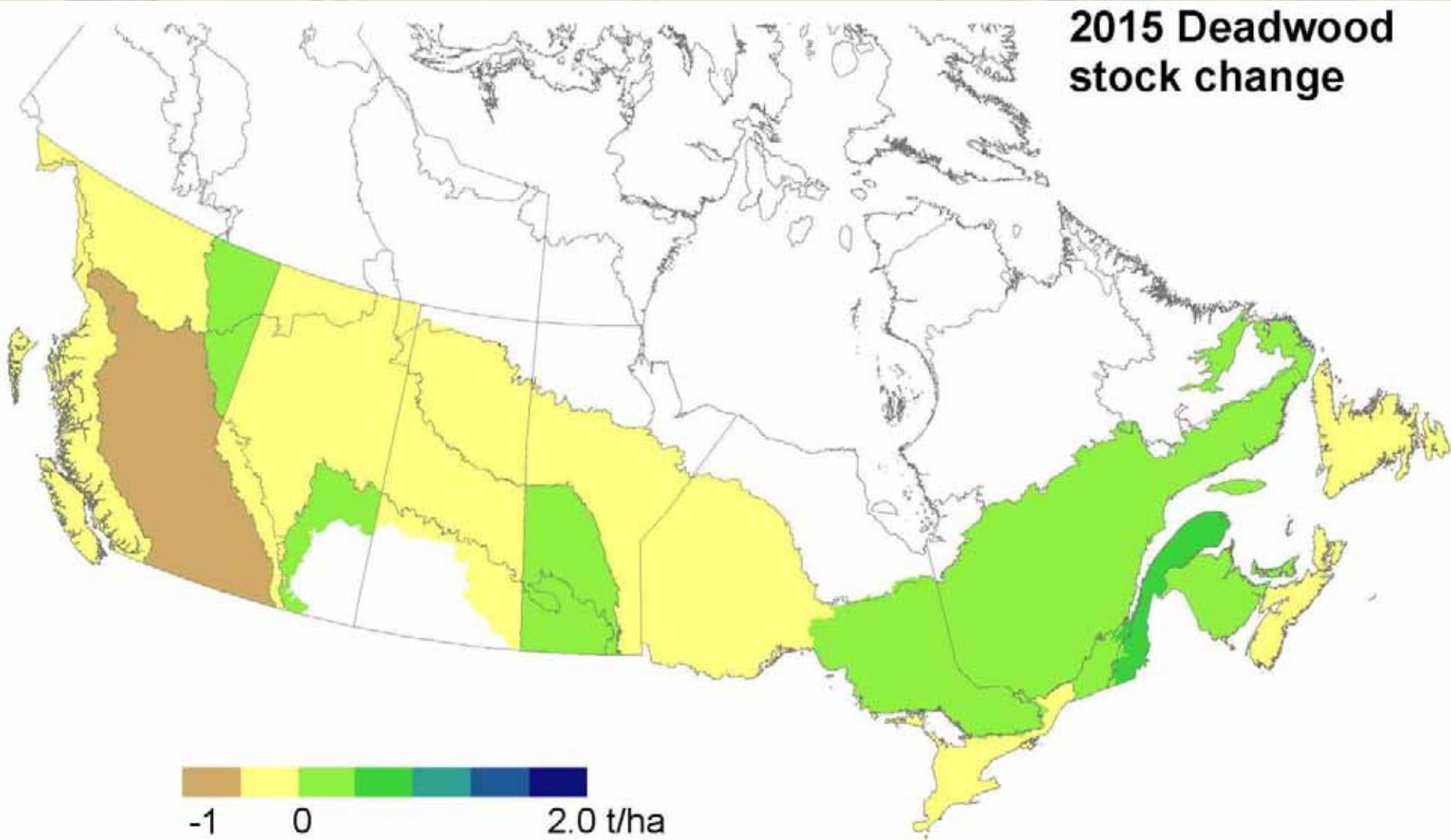
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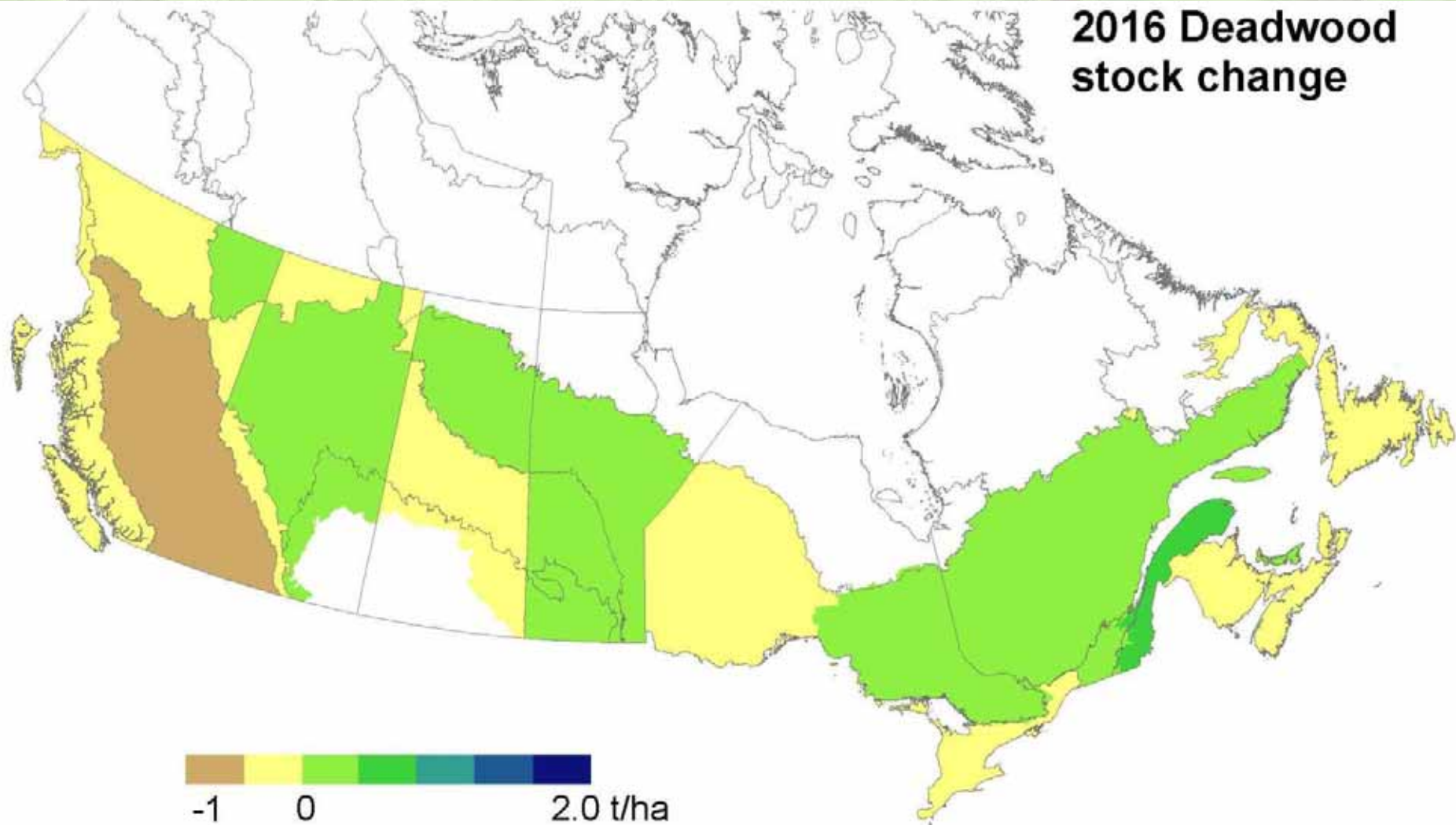
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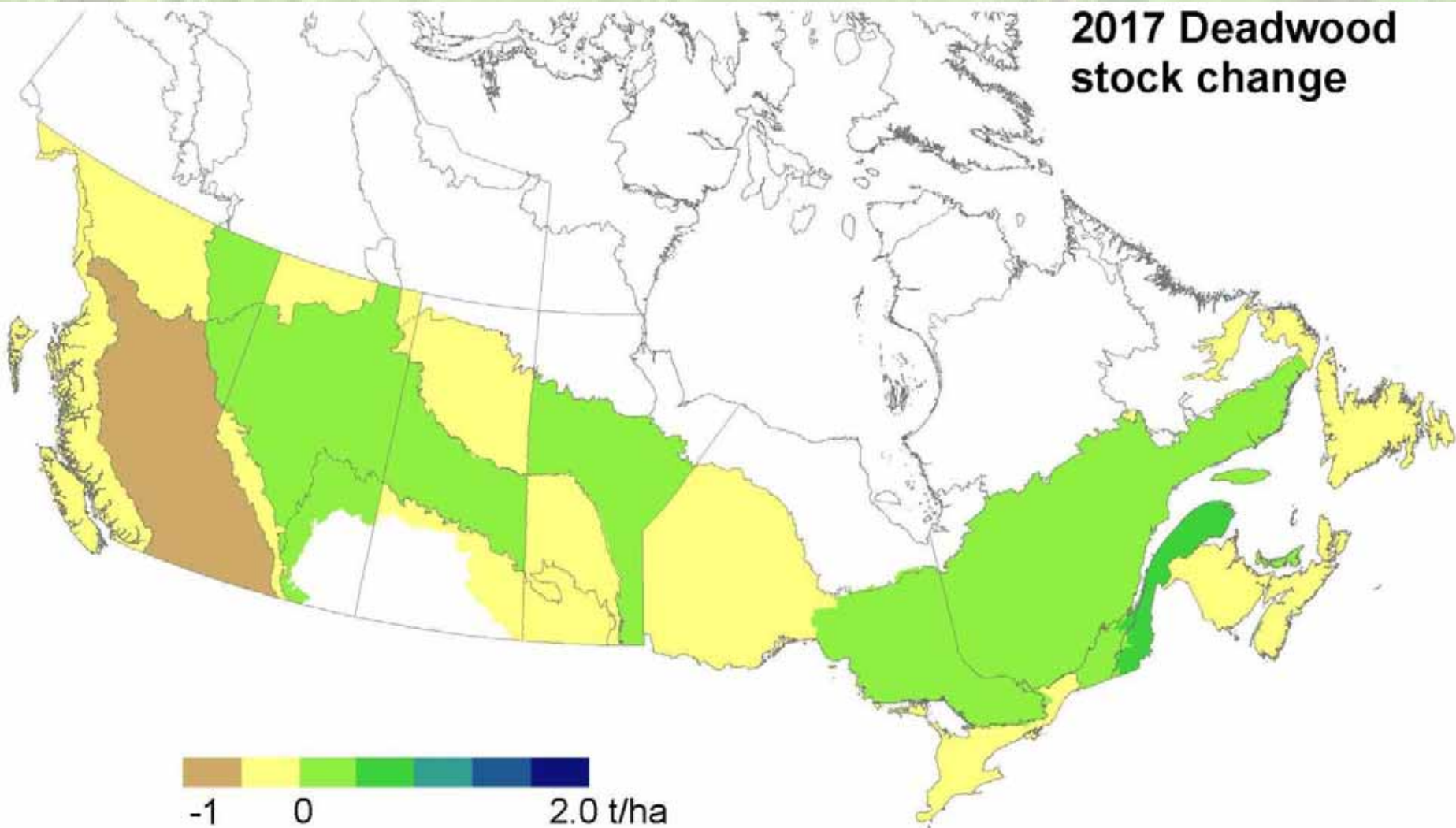
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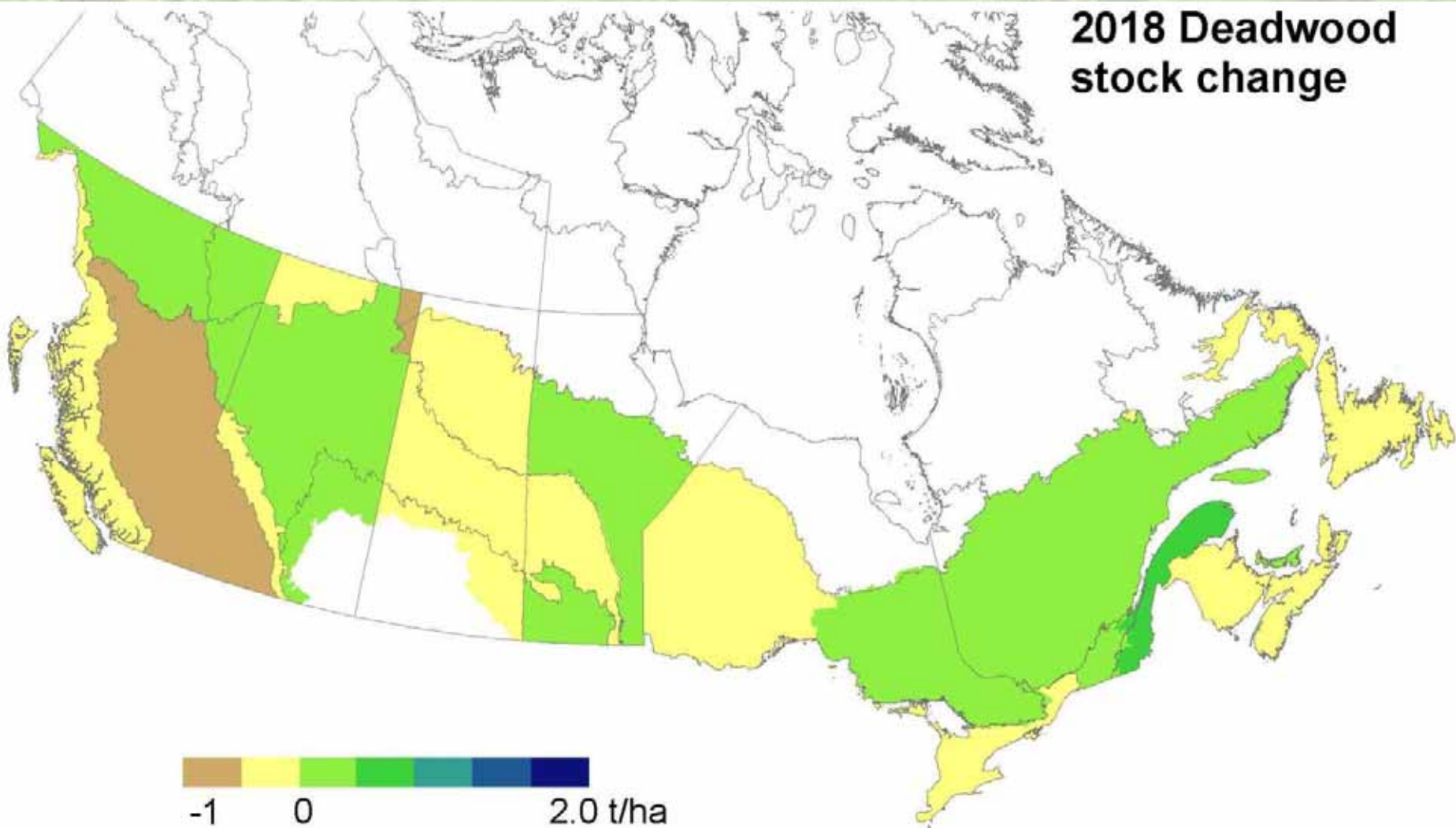
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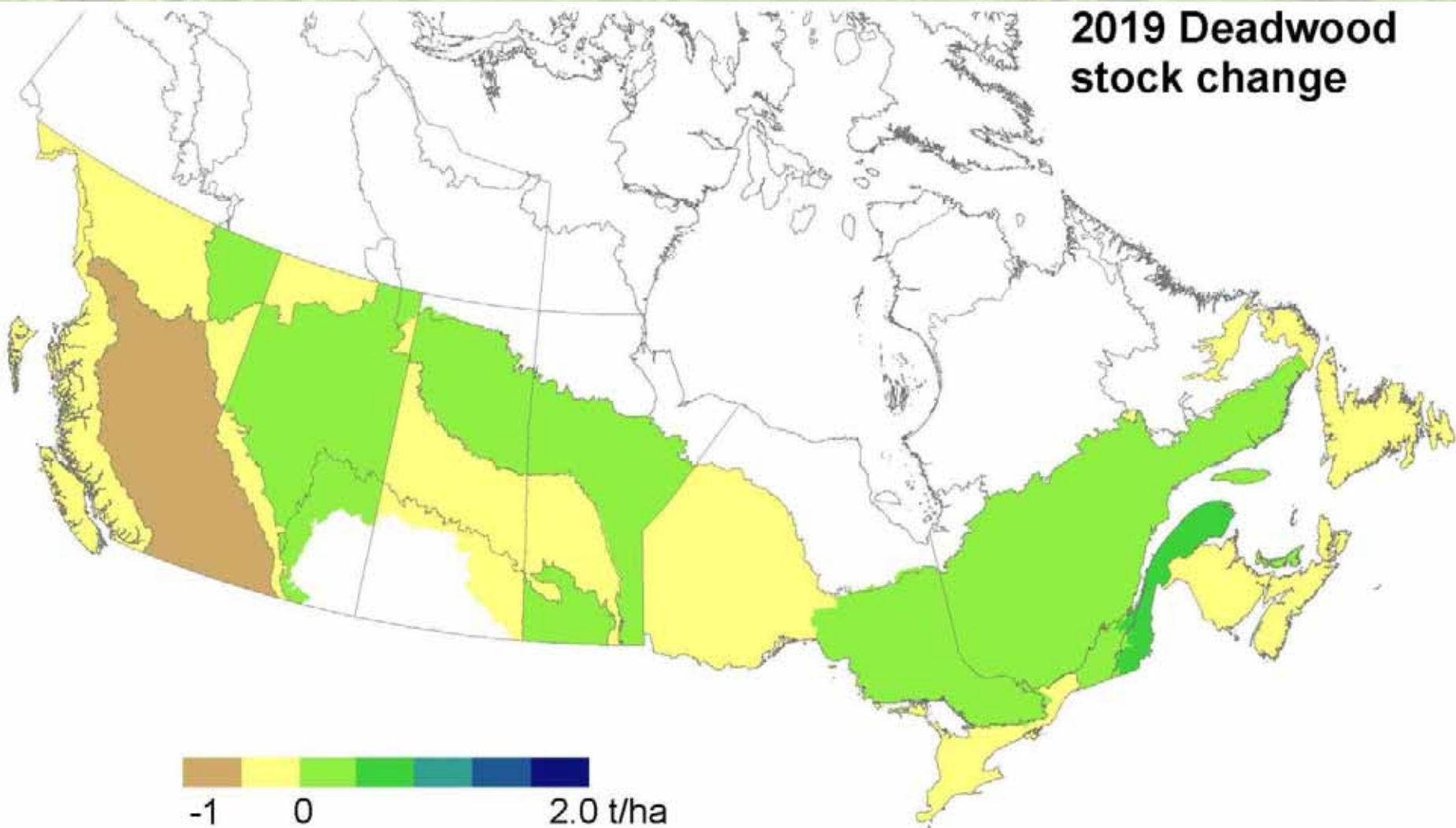
RESULTS



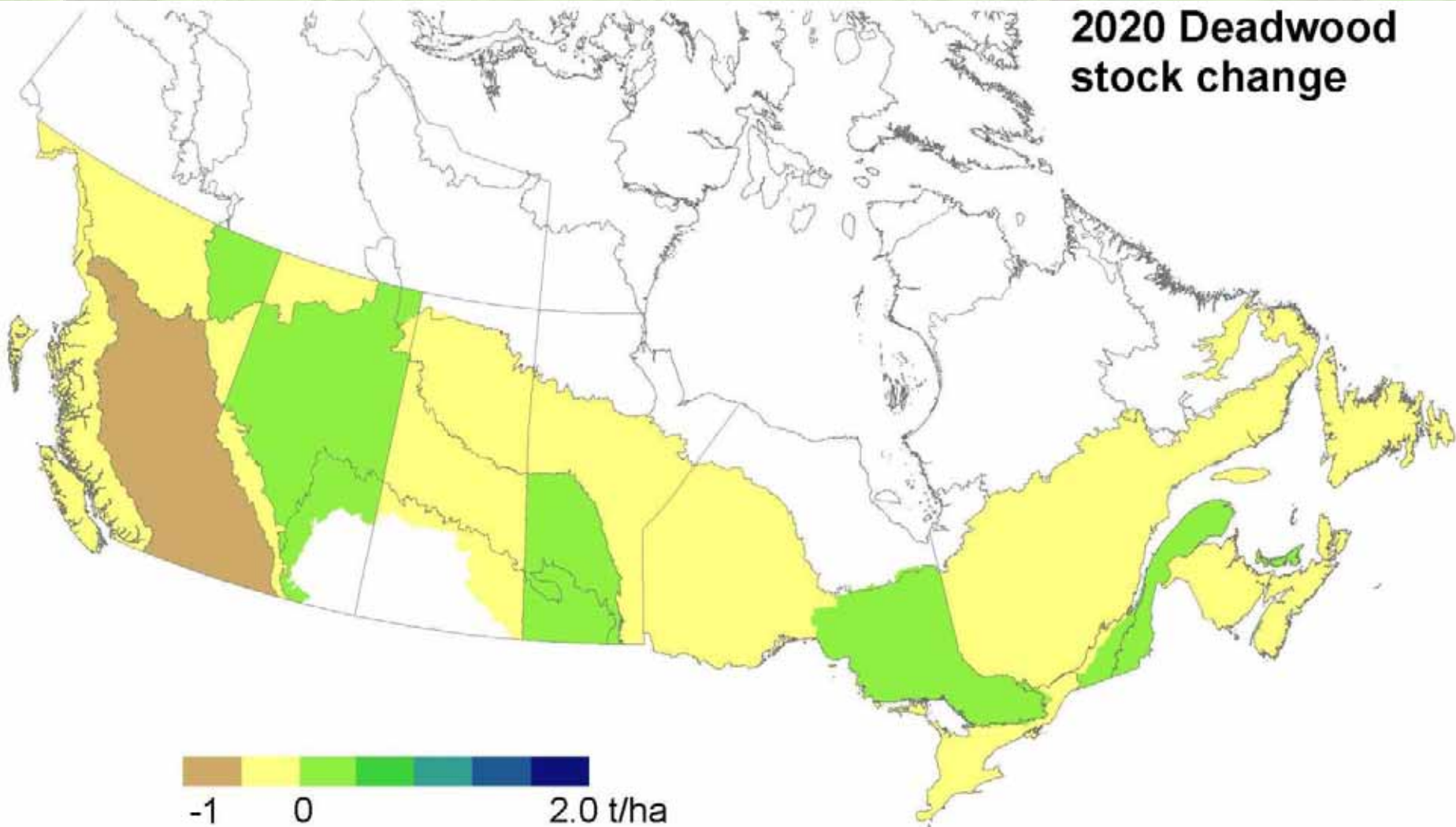
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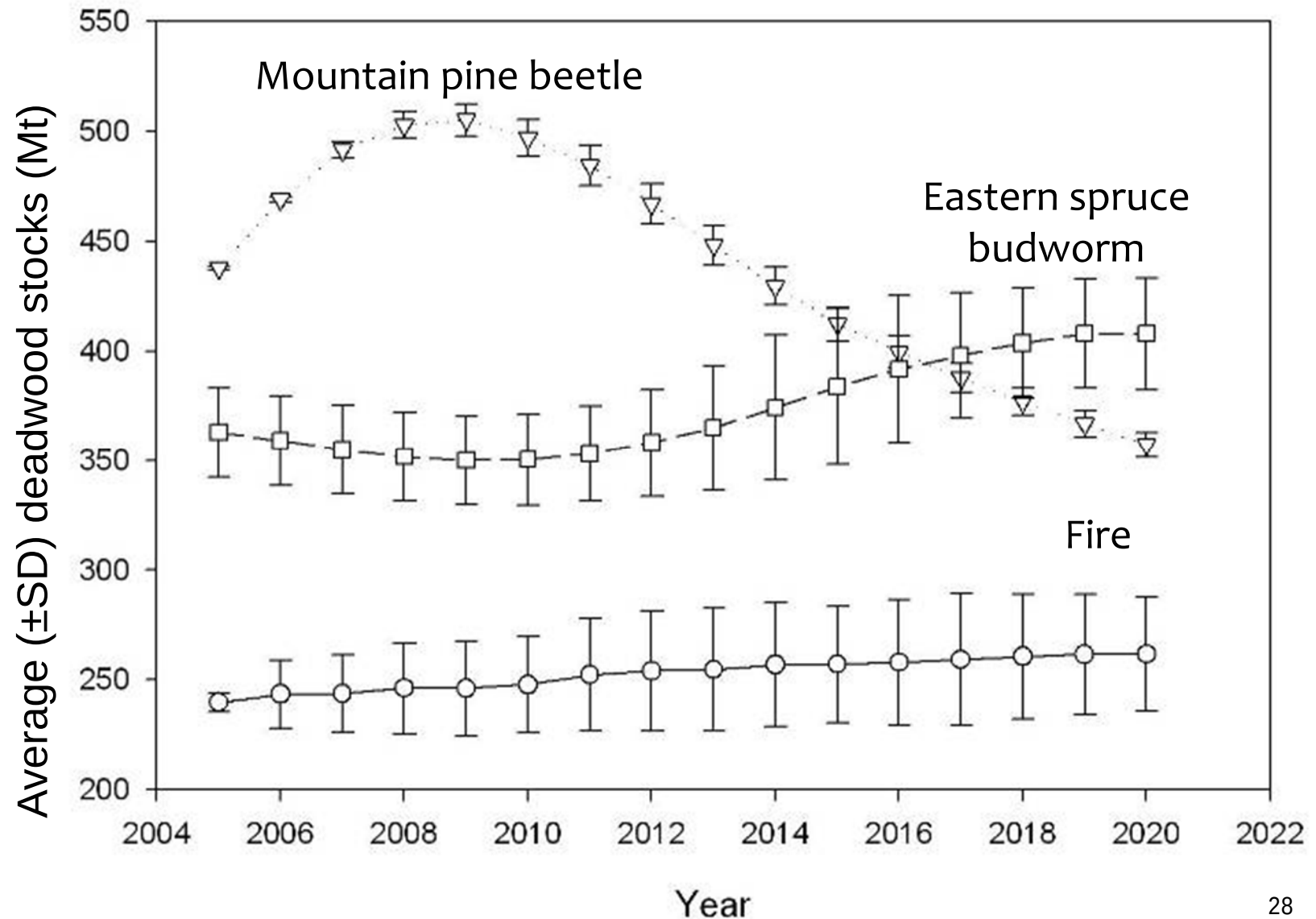
RESULTS



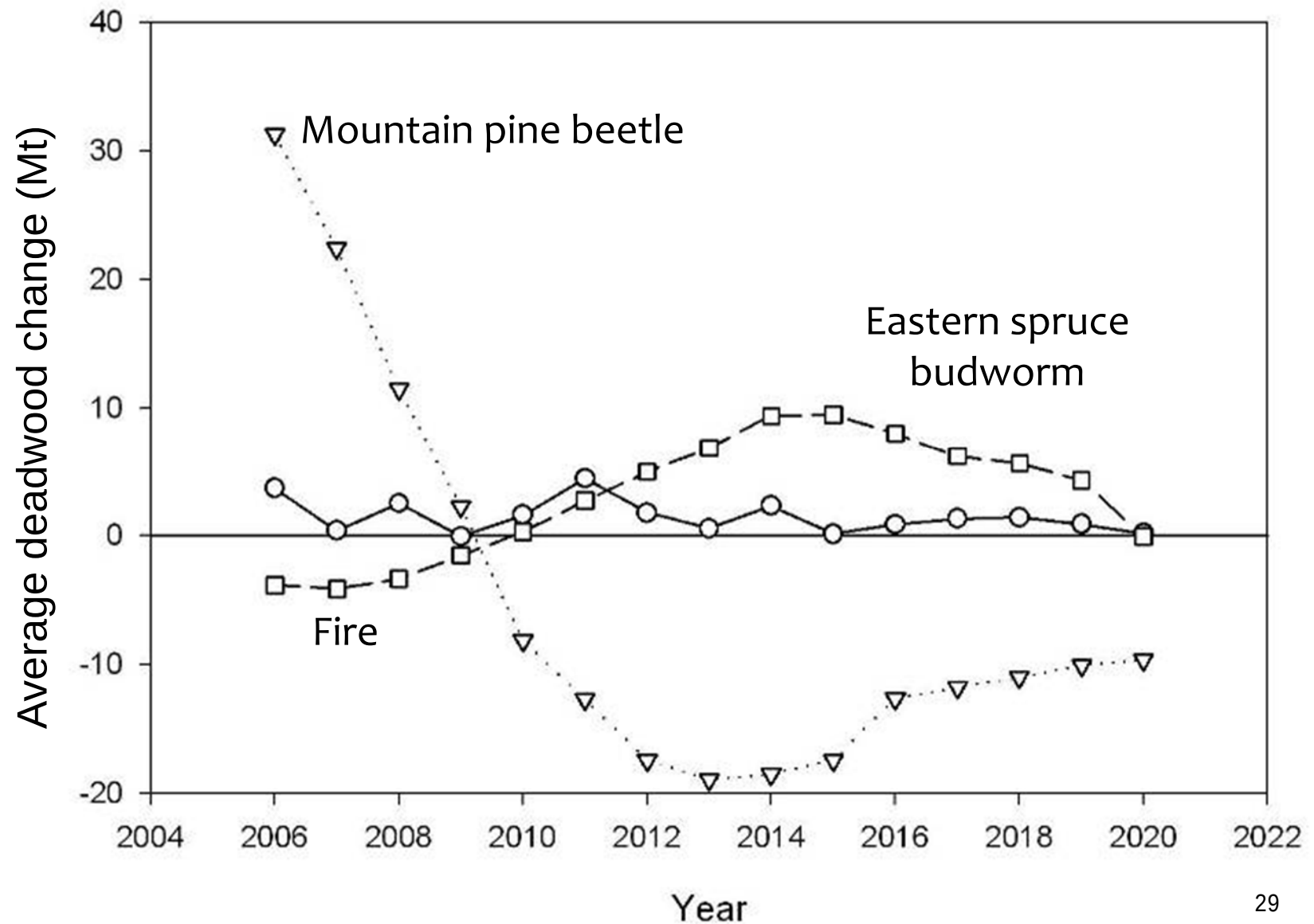
RESULTS



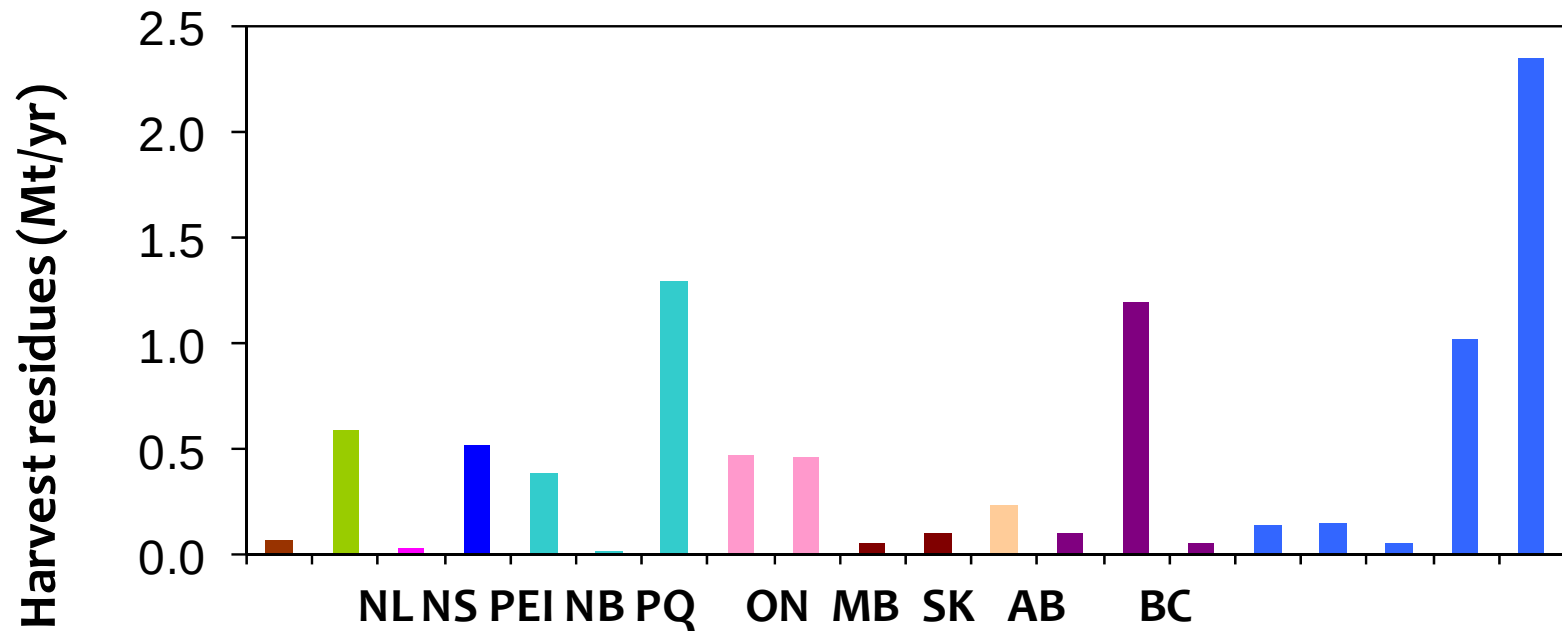
Results – 3 Natural disturbance patterns



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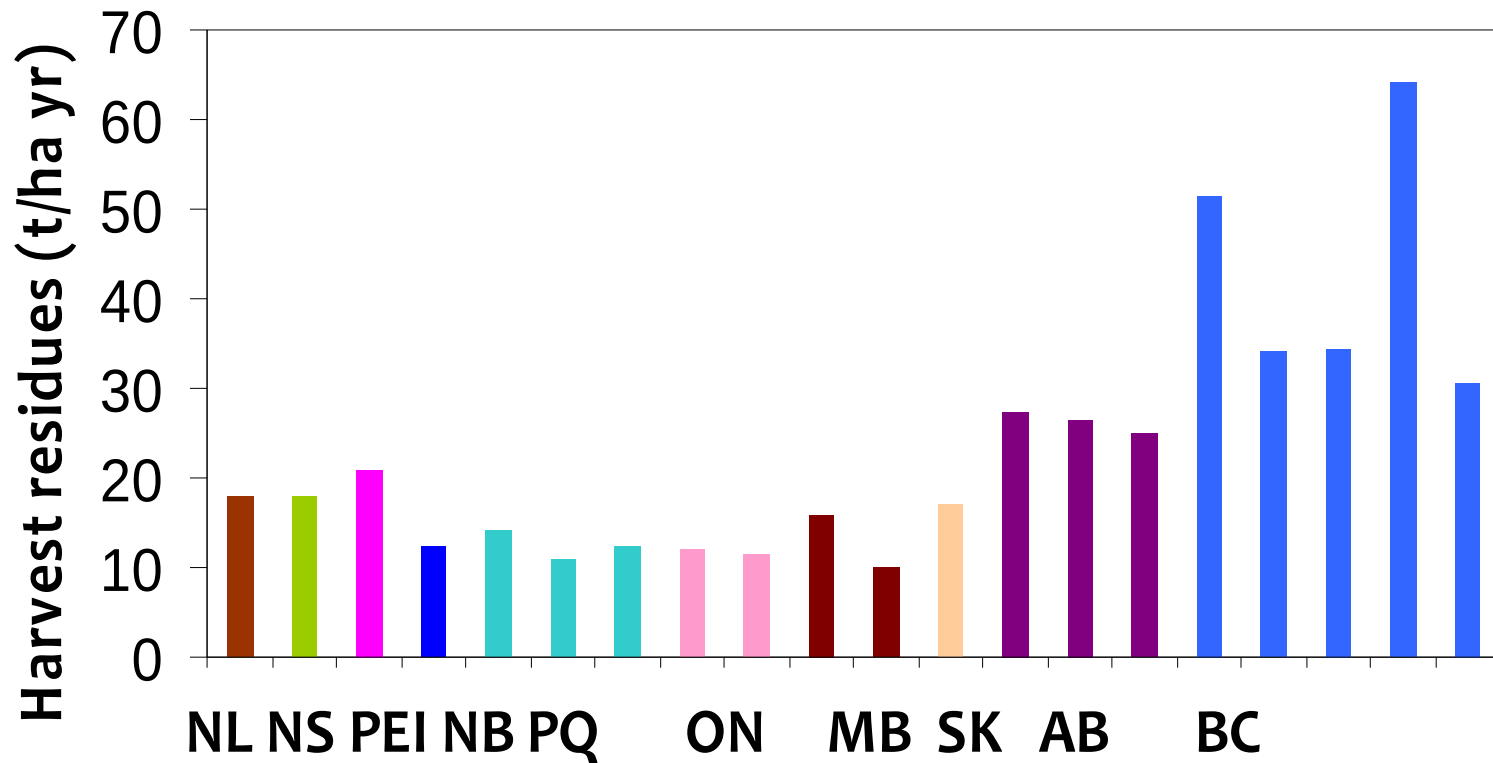


Results – Harvest residues 2005-2020



** Assumes no slash burning

Results – Harvest residues 2005-2020



** Assumes no slash burning

What do we know about the future?

- Thousands of tonnes of potential feedstock from harvest residues.
- Millions of tonnes potentially from fire and insects, even after discounting by 50% and for foliage.
- Availability is temporary in either space, time or both.
- Burning wood releases methane and nitrous oxide as well as carbon dioxide. Therefore burning has a greater global warming potential than allowing the wood to decompose.

What do we know about wood-based bioenergy?

Positives

- You can't eat wood
- Carbon is already part of the biosphere, not adding from fossilized sources.
- Short-term substitute for fossil fuels if being burned anyway.
- Bioenergy is considered “clean” if
 - the trees are already dead
 - there is a comparable level of growth on the landscape (renewability)
 - Substitute for fossil fuels.

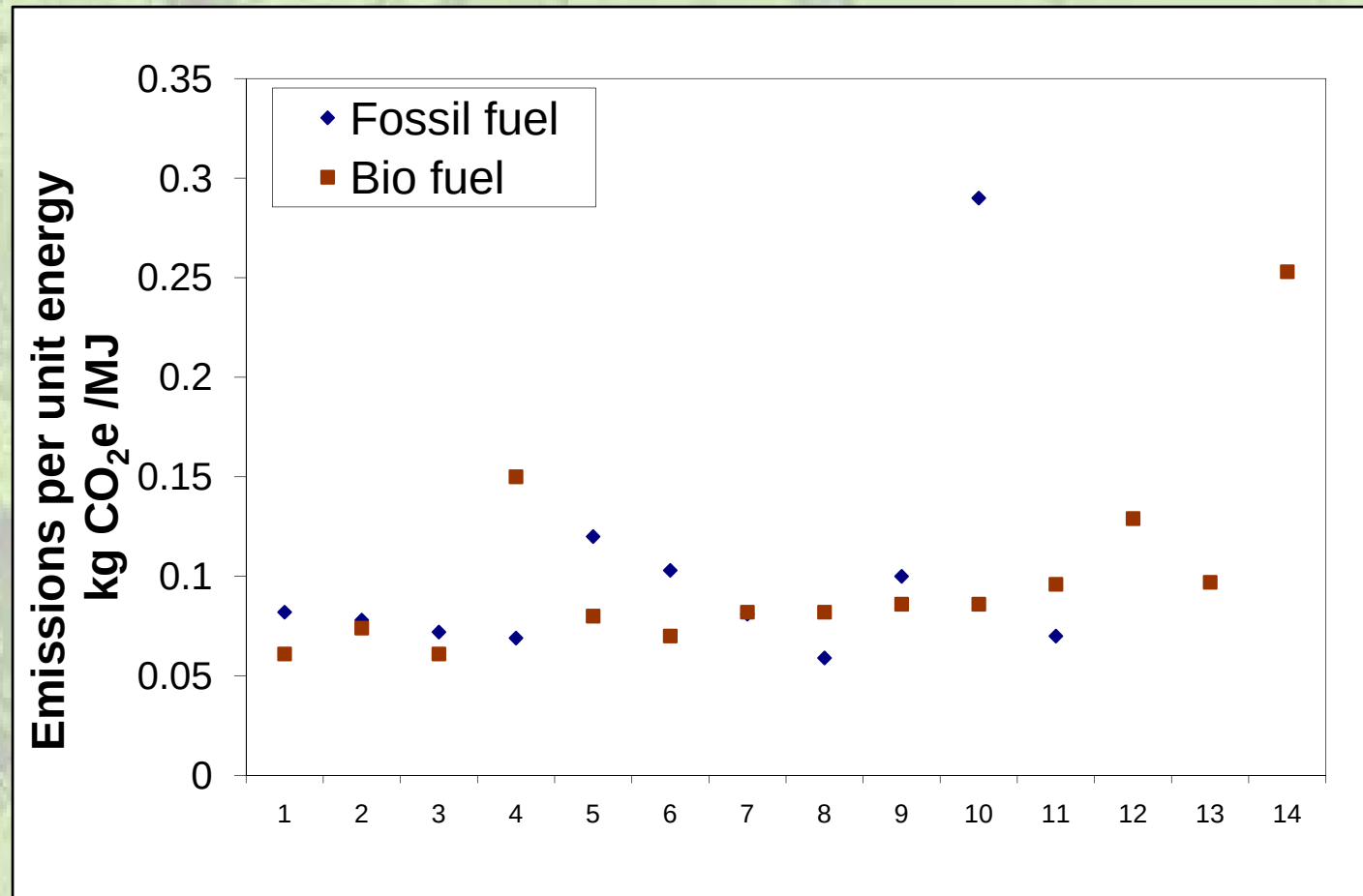
Negatives

- The forest animals, insects and plants need some of that biomass to live.
- It takes fossil fuels to move wood around. e.g. BC Hydro “woodshed” of 100 km.
- The energy density of wood is low.



Short-term energy efficiency

* Long-term recapture by re-growth <100%

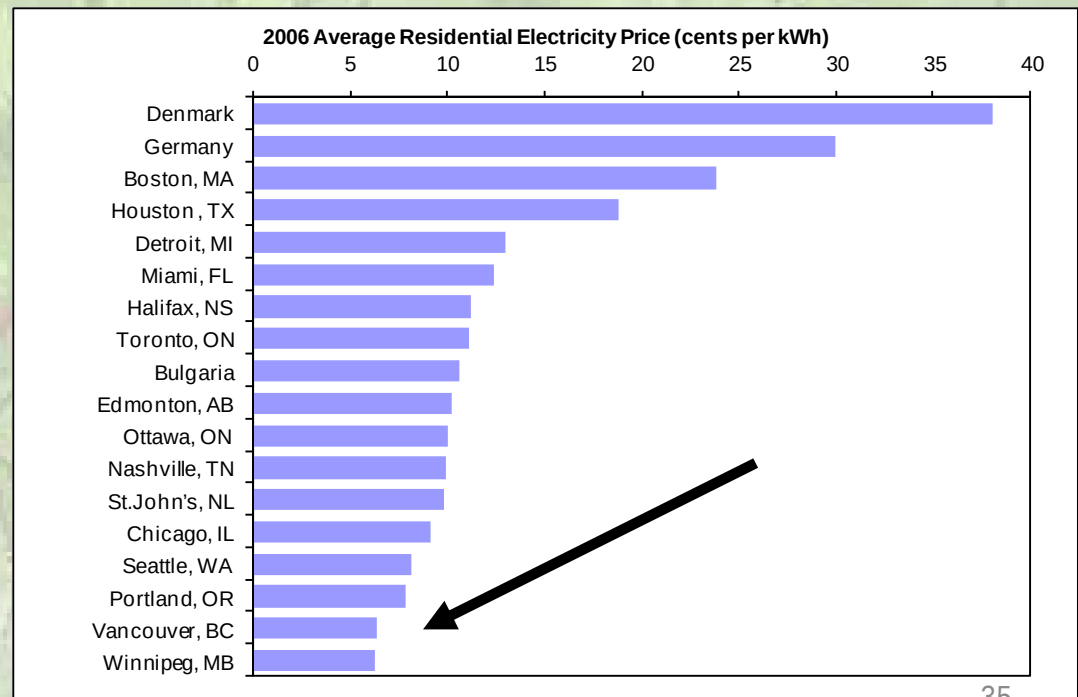


Sims et al 2006 Global Change Biology



What don't we know?

- Energy prices in BC are expected to rise but will bioenergy be profitable?
- Greenhouse gas life-cycle analysis is incomplete for BC but has been done for Europe and show to effectively reduce emissions under some circumstances. Not 100% offset even over 100 yrs.



Source: BC Energy Plan & business news on the web



What don't we know?

- Leaving the foliage and 50% of the wood may not always be sufficient.
- Climate change will impact the growth and death rates of trees but we don't know by how much or in which direction.

Thanks!

- For more information: Caren.Dymond@gov.bc.ca
- This project received partial funding from the Panel on Energy Research and Development (PERD) administered by Natural Resources Canada."

