Biodiversity Risk Asessment in the Oil Sands Region

Actionable science for making decisions

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Presentation Link

Background image credit: Michael Benz

The Roadmap:

Describing our overall approach

Risk Assessment vs. 'Prediction'

From science to decisions

Climate Vulnerability and Adaptation

The world has moved on...

Species are **Vulnerable** to change

What can we do?

We can **Adapt** to this change

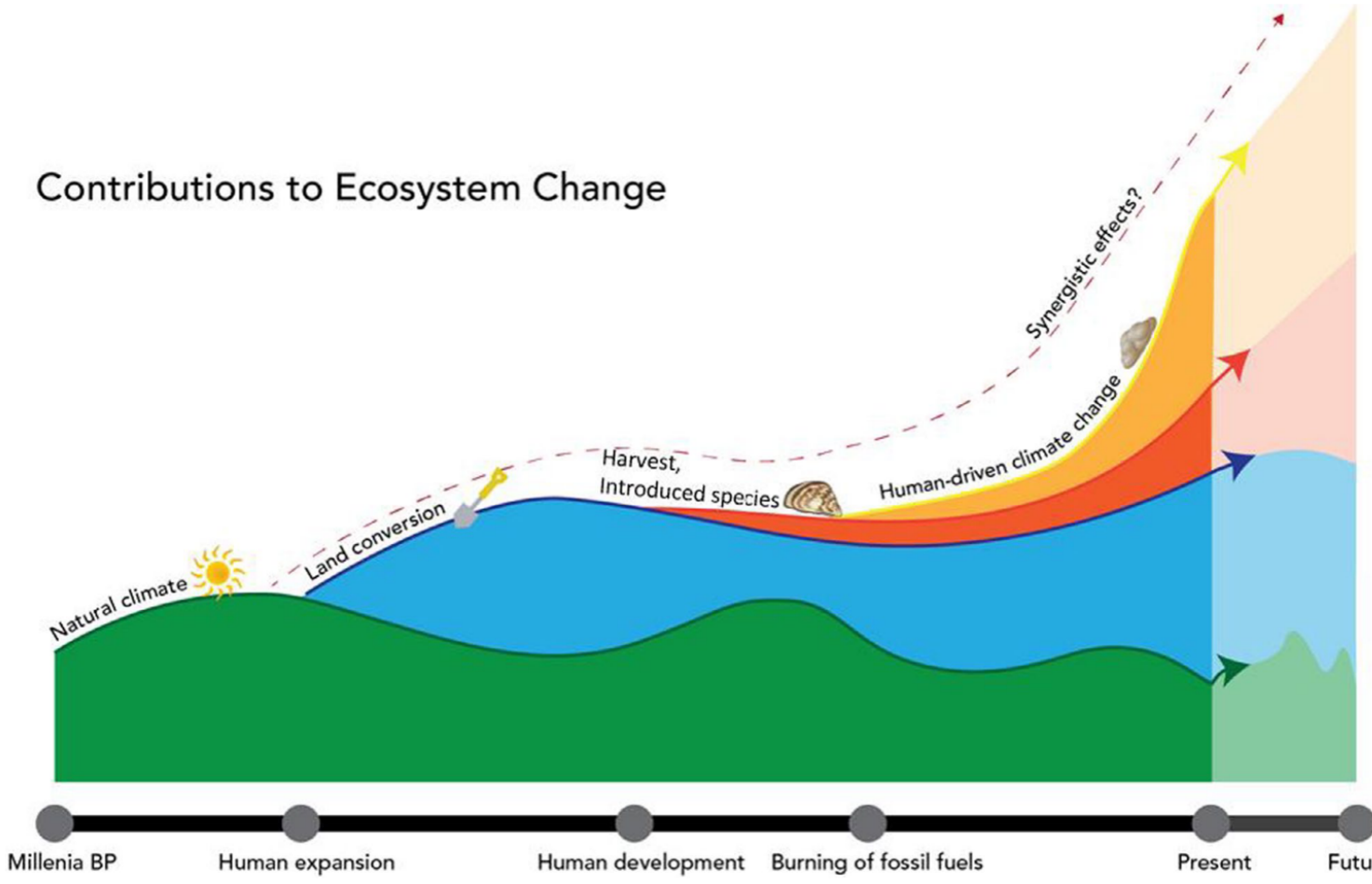
Some terms:

Vulnerability: *Exposure*, *Sensitivity*, and *Adaptive Capacity* of species or systems to environmental change

Adaptation: intentional adjustments to natural systems to address bioidiversity risks posed by vulnerability

Ecosystem Transformation

(Thompson et al. 2022; Fisheries)



Changing Response Pathways in the Boreal

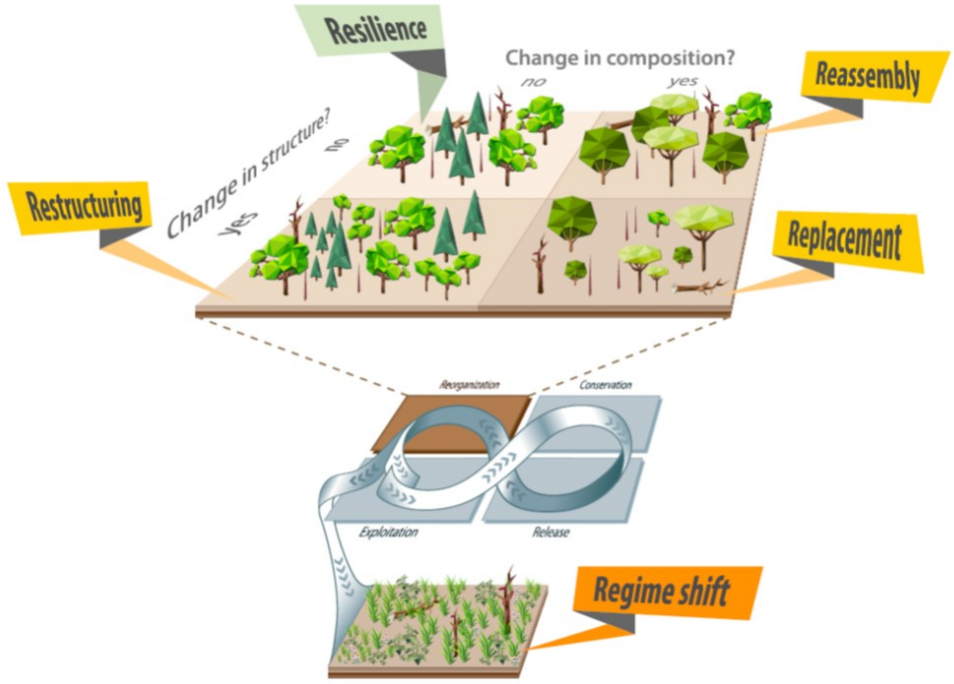
1. **Resilience:** historic successional pathway

2. **Restructuring:** same composition, new structure

3. **Reassembly:** same structure, new composition

4. **Replacement:** new composition and structure

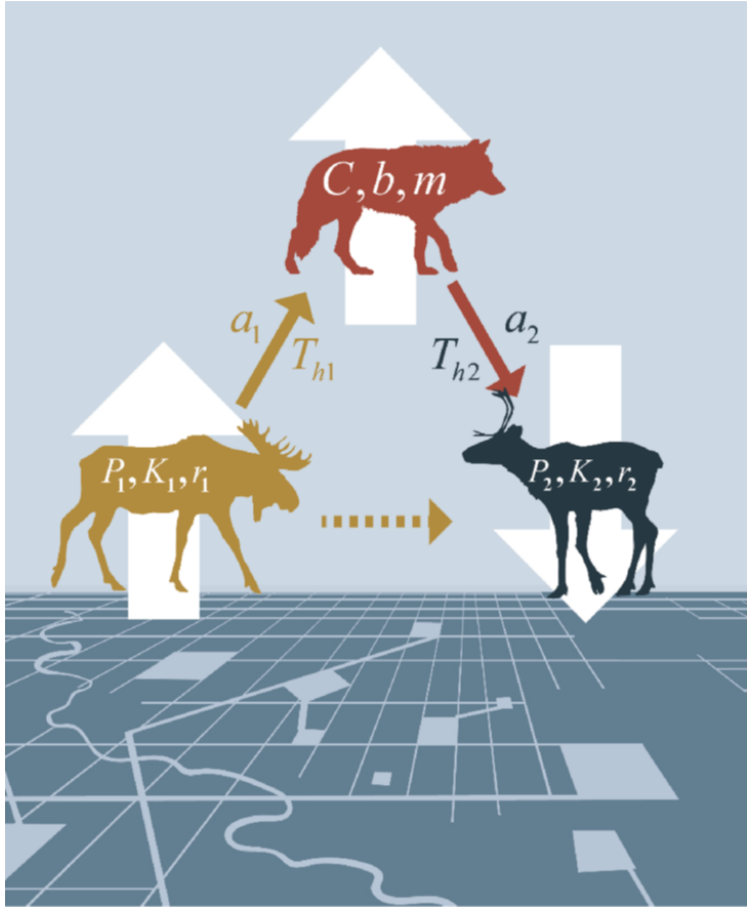
5. **Regime shift:** no longer a forest



(Seidle and Turner 2022; PNAS)

Effects of Forest Fragmentation

(Serrouya et a,. 2020; Ecological Modeling)



The overall goals of the Risk Assessment framework

1. Assess boidiversity risks in terms of vulnerability to landscape and climate change

2. Inform the development of adaptation strategies

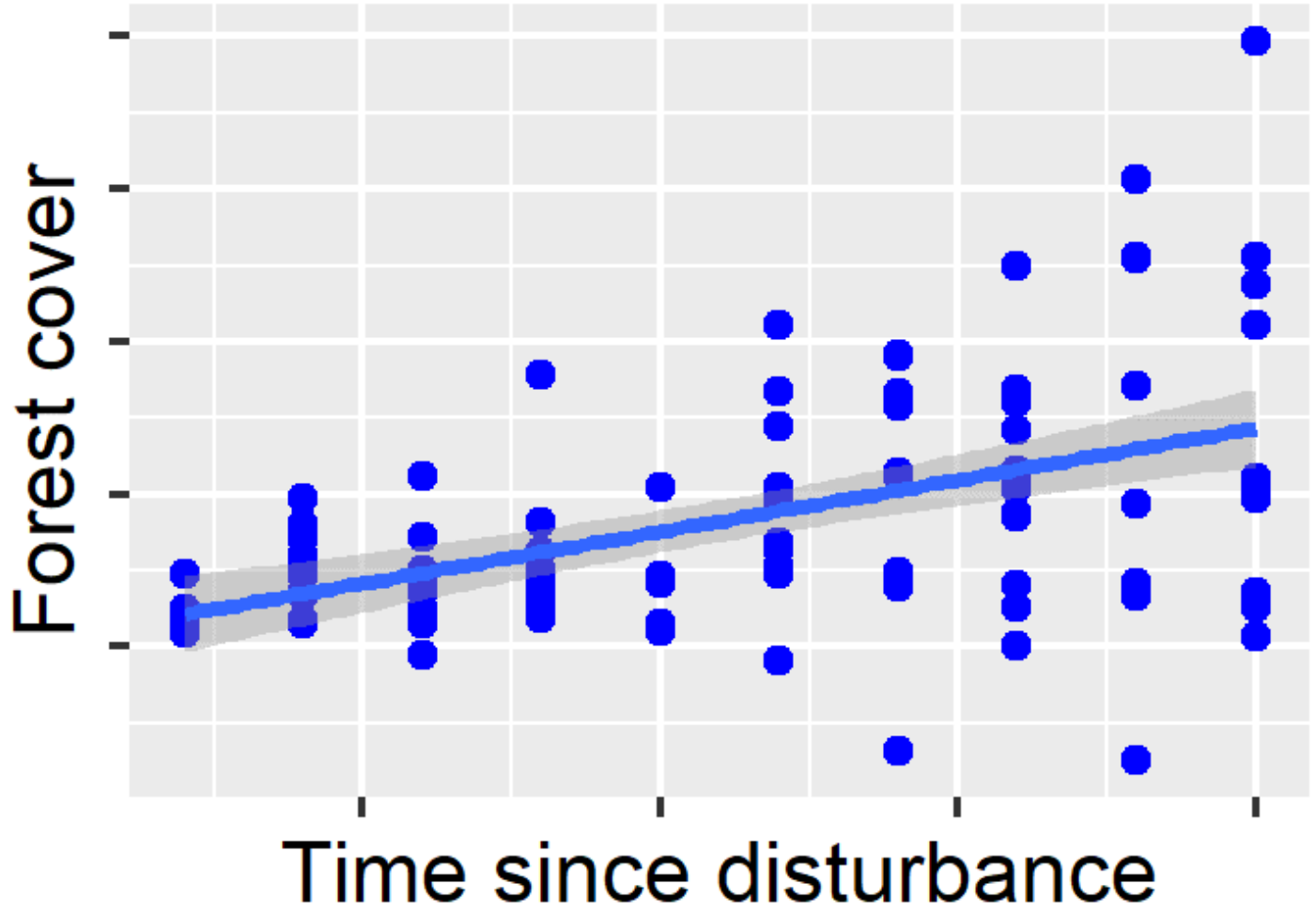
The key challenge is uncertainty

The Problem of Predicting the Future

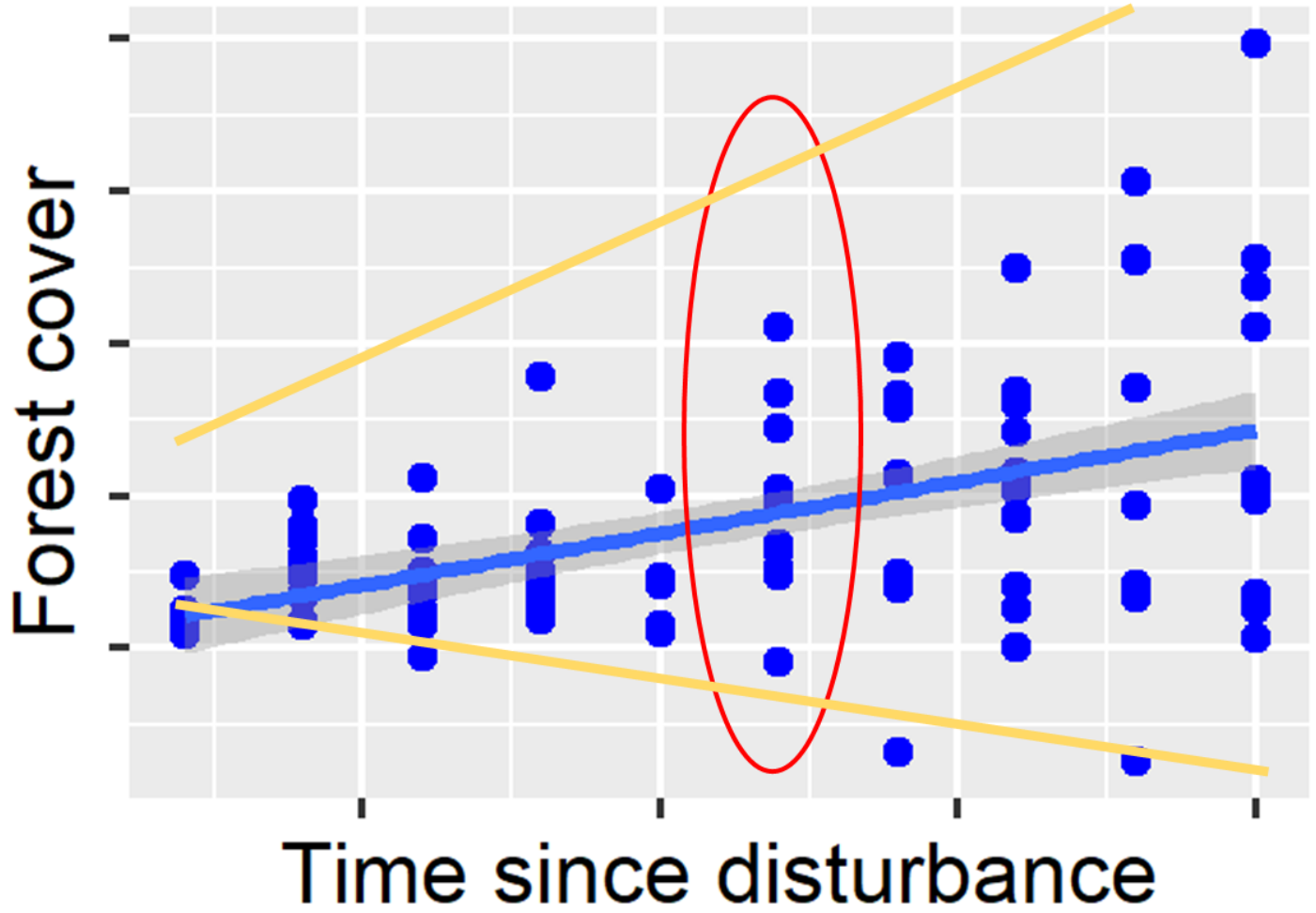
We know that the future is uncertain.

Future ecosystem states are difficult (i.e. *Impossible*) to predict

The limits of deterministic modelling



The limits of deterministic modelling



Forecasting and the Risk Assessment Framework

What do these things mean?

Forecasting estimates future conditions based on knowledge of ecological processes

Risk assessment calculates the probabilities of various outcomes based on the forecasting model

Implementing Risk Assessment

Forest Ecology and Management 400 (2017) 542–554

Contents lists available at ScienceDirect

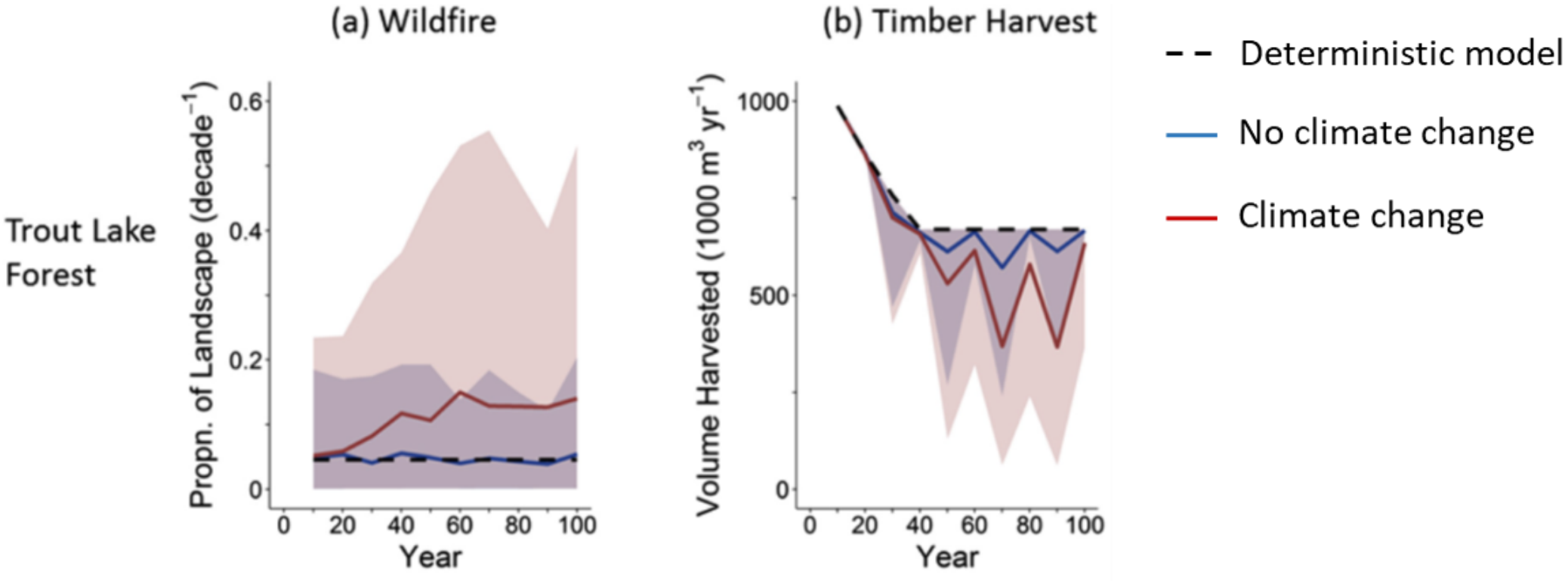
Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

Incorporating uncertainty into forest management planning: Timber harvest, wildfire and climate change in the boreal forest

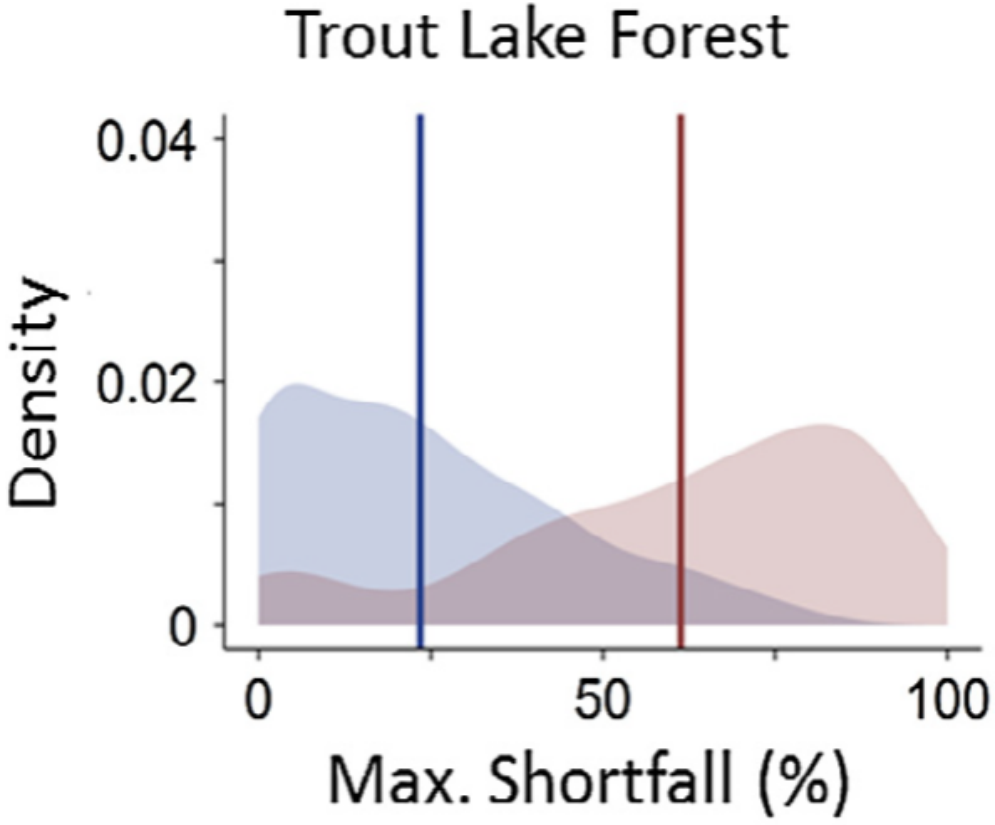
Colin J. Daniel [a,b,*], Michael T. Ter-Mikaelian [c], B. Mike Wotton [d], Bronwyn Rayfield [b], Marie-Josée Fortin [a]

Failure to consider uncertainty in wildfire and harvest



Greater area burned | Shortfalls in timber harvest

Probabilities of maximum harvest shortfall over 100 years



Density distribution of maximum harvest shortfall

- Mean maximum shortfall of 23% with no climate change
- Mean maximum shortfall of 61% with climate change

From Forestry to Oil Sands

Wildfire and forest harvesting as baselines in landscape simulation models

- Models already published or in development

Seismic line recovery models from BERA

New grad projects provide fragmentation effects

Risk Assessment and Structured Decision Making (SDM)

SDM is a formal process for making decisions under uncertainty

Beginning to see greater use in wildlife managemnt

Requires active participation of managers and stakehoders throughout the process

Looking Ahead

Develop a prototype over the next 6 months

Publish methods first, then papers on both ecology and management implications

Develop tools for dessemination

Final thoughts

Decisions need to be made under uncertaitny

We need to anknowledge and incorporate that uncertianty

Risk assessemnt is a powerful tool for accomplishing this goal