

Preliminary impacts of Climate Change on Carbon

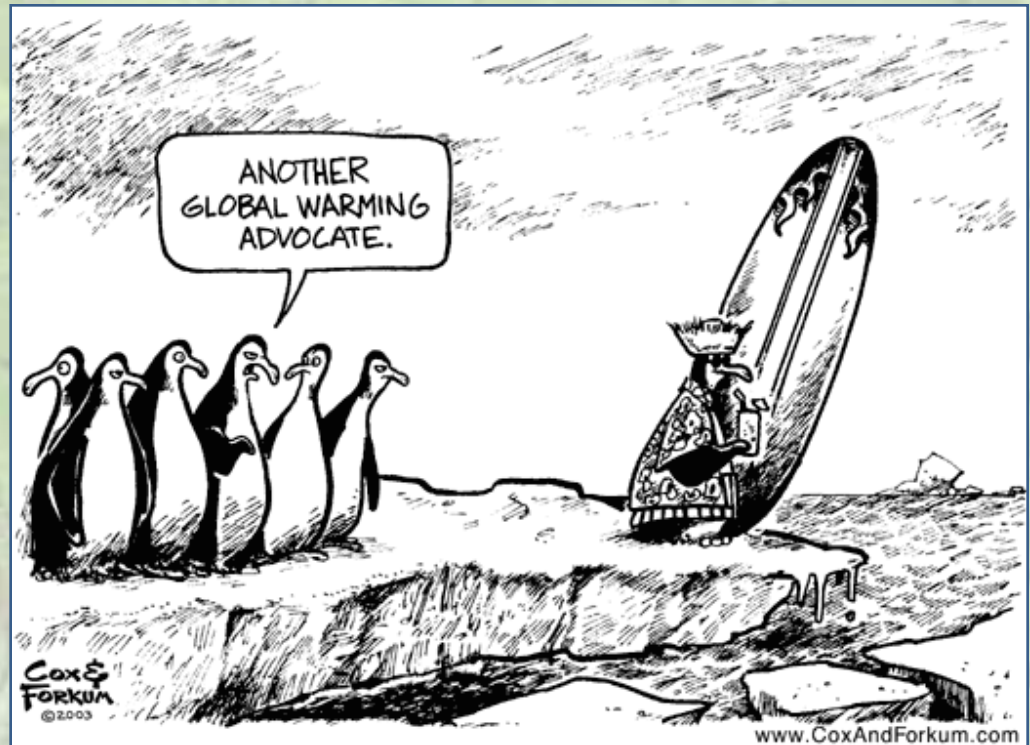
Caren Dymond, Juha Metsaranta, David Spittlehouse and Werner Kurz

Acknowledgments

- FIA-FSP funding

Outline

- Why do we care?
- Projected changes
- Impacts on carbon
- How can we improve?
- Implications for managers



Why do we care?

- Our climate is changing, including an increase in global average temperatures since the mid-20th century.
- This change is caused by human activities creating greenhouse gases.
- The effects of this change will worsen if no action is taken to reduce our overall greenhouse gas emissions.
- These climate changes will have significant and damaging impacts on human society, industry, and our natural environment.

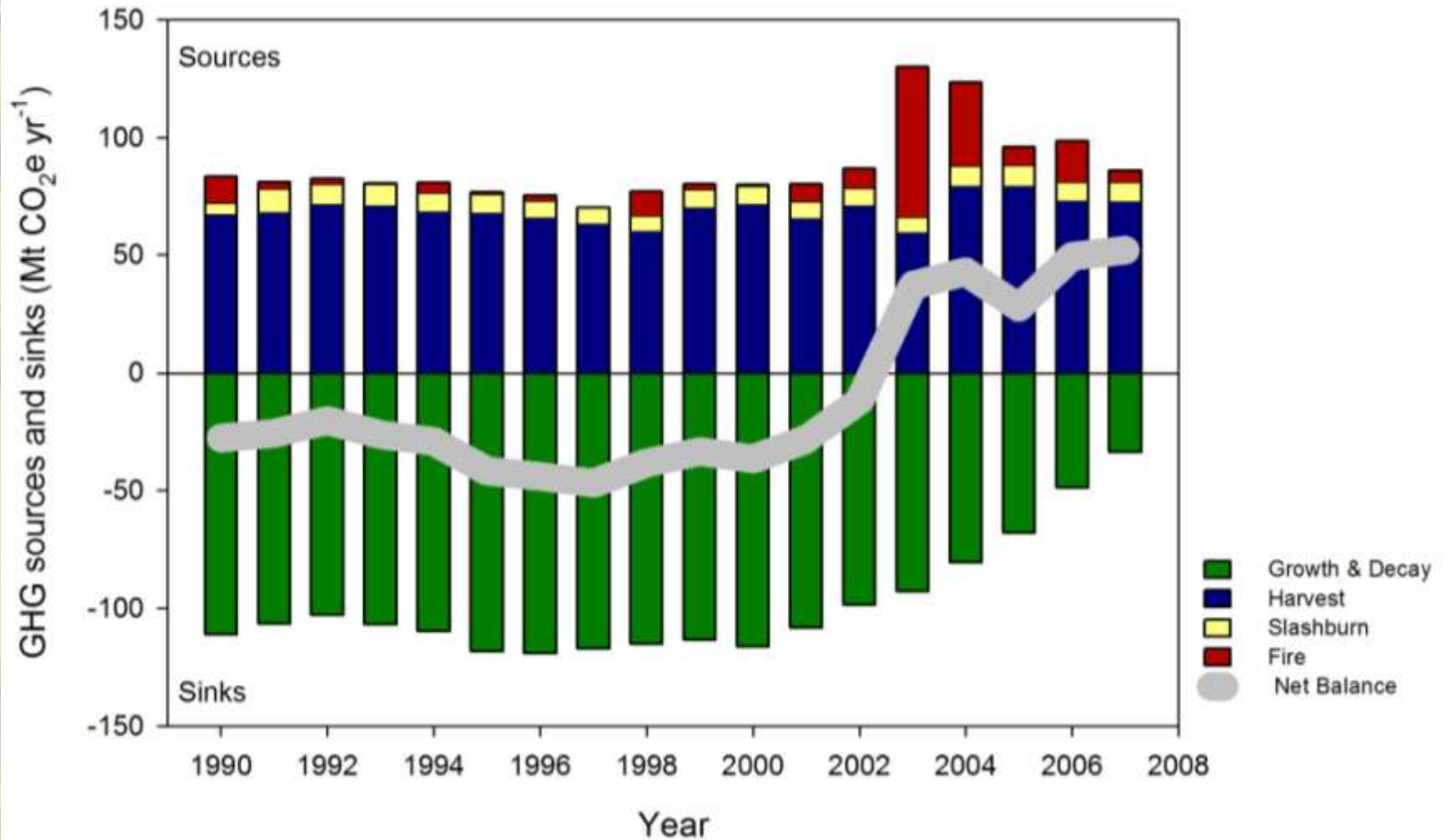
Bottom Line

- Balance of evidence points to a need to consider the forecasts of a changing climate seriously
 - Mitigation + adaptation
- Society's views of the situation are changing
 - Increased willingness to change behaviour
 - Changing social license for the forestry and agriculture sectors
 - New policies
 - New economics (e.g. consumer choice, offsets)



Snowman
- B. Bouton

Forest ecosystem of British Columbia



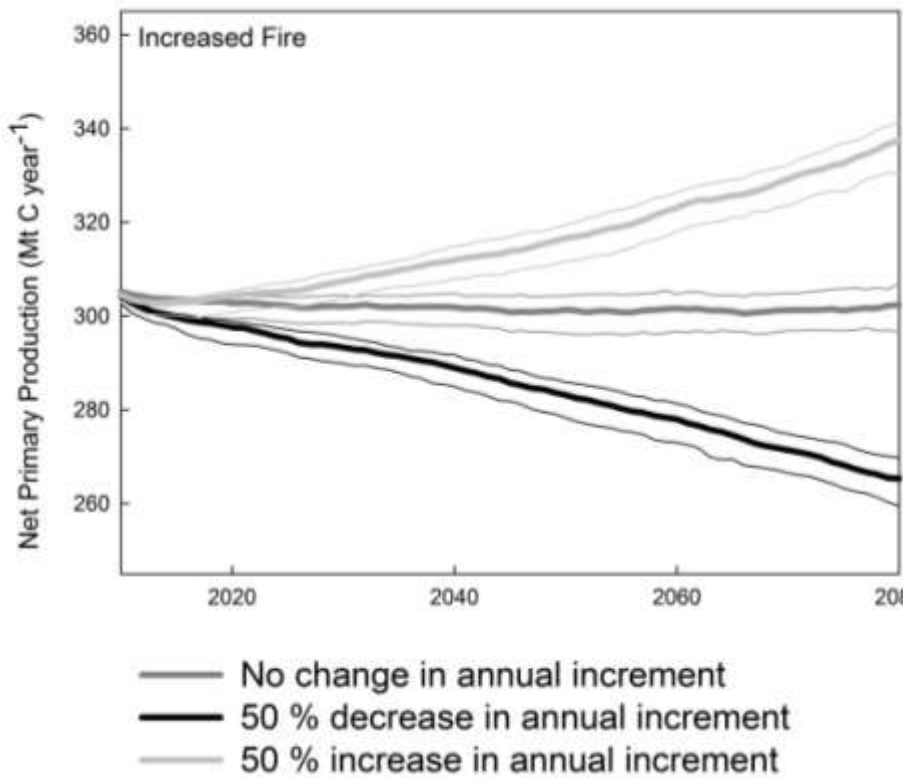
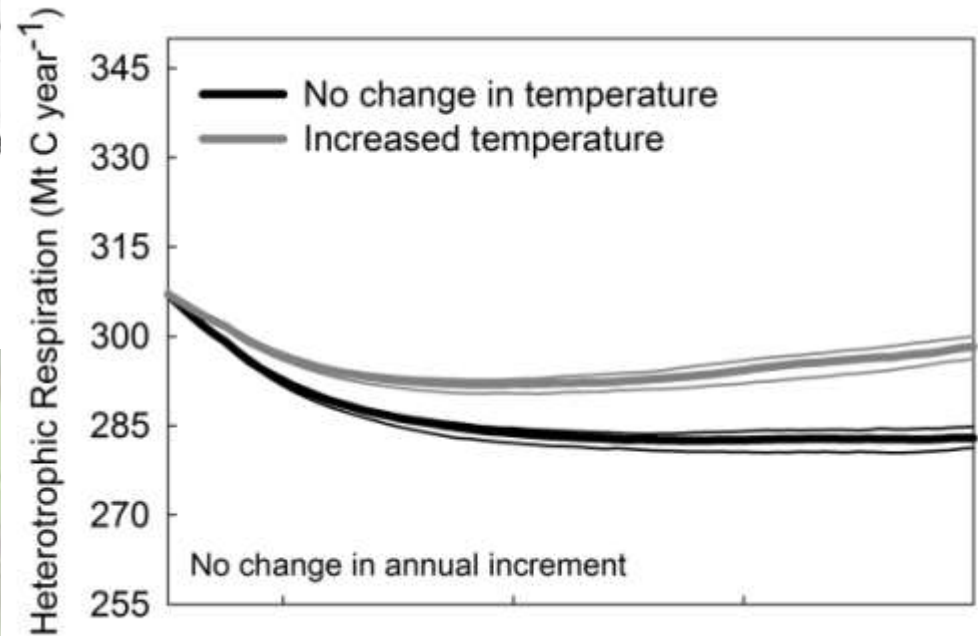
What will the future bring?

- Intention was only to define the range of possible future outcomes.
- Can not describe likelihood
- All are within the realm of the possible

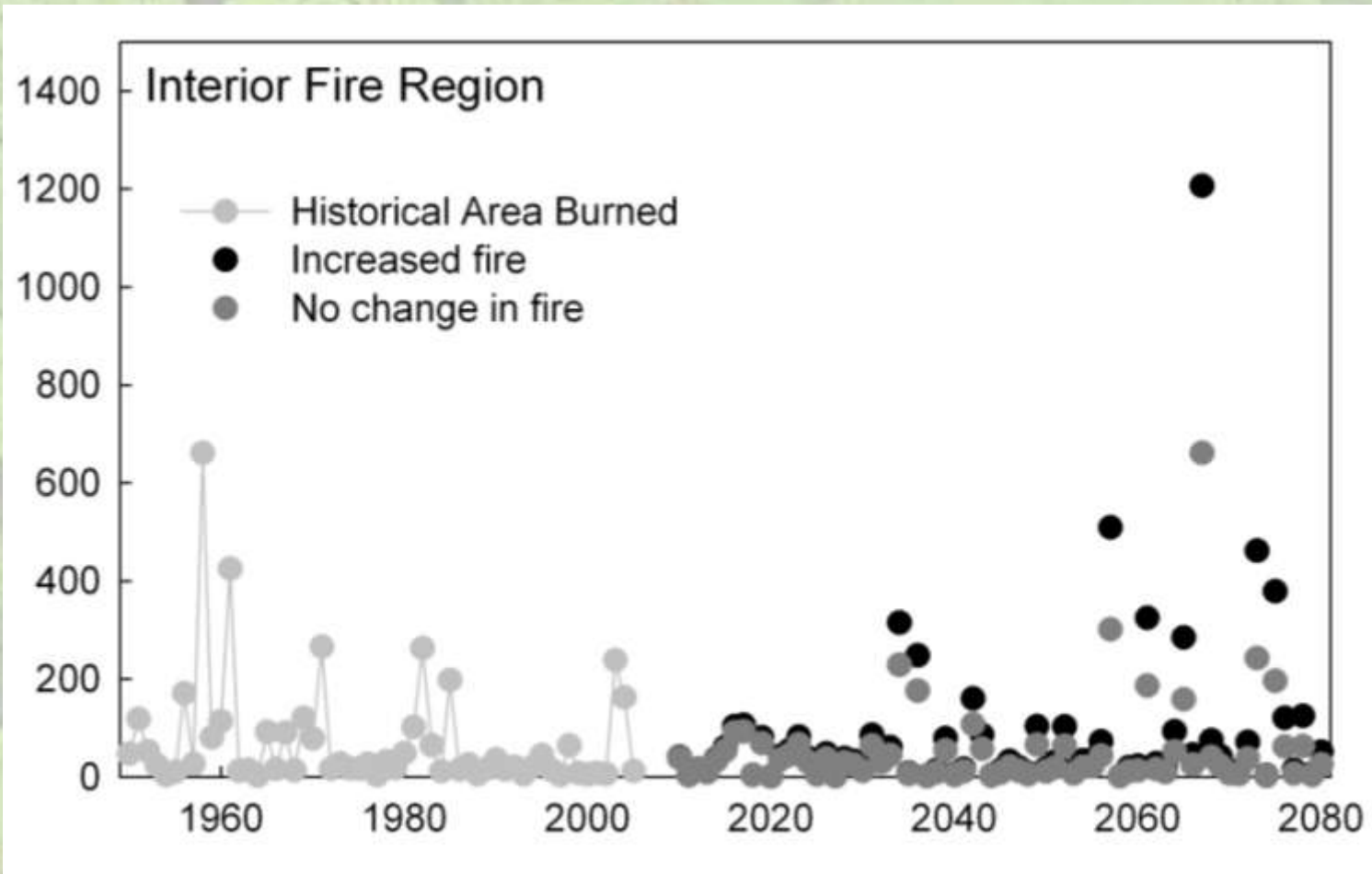
Methods

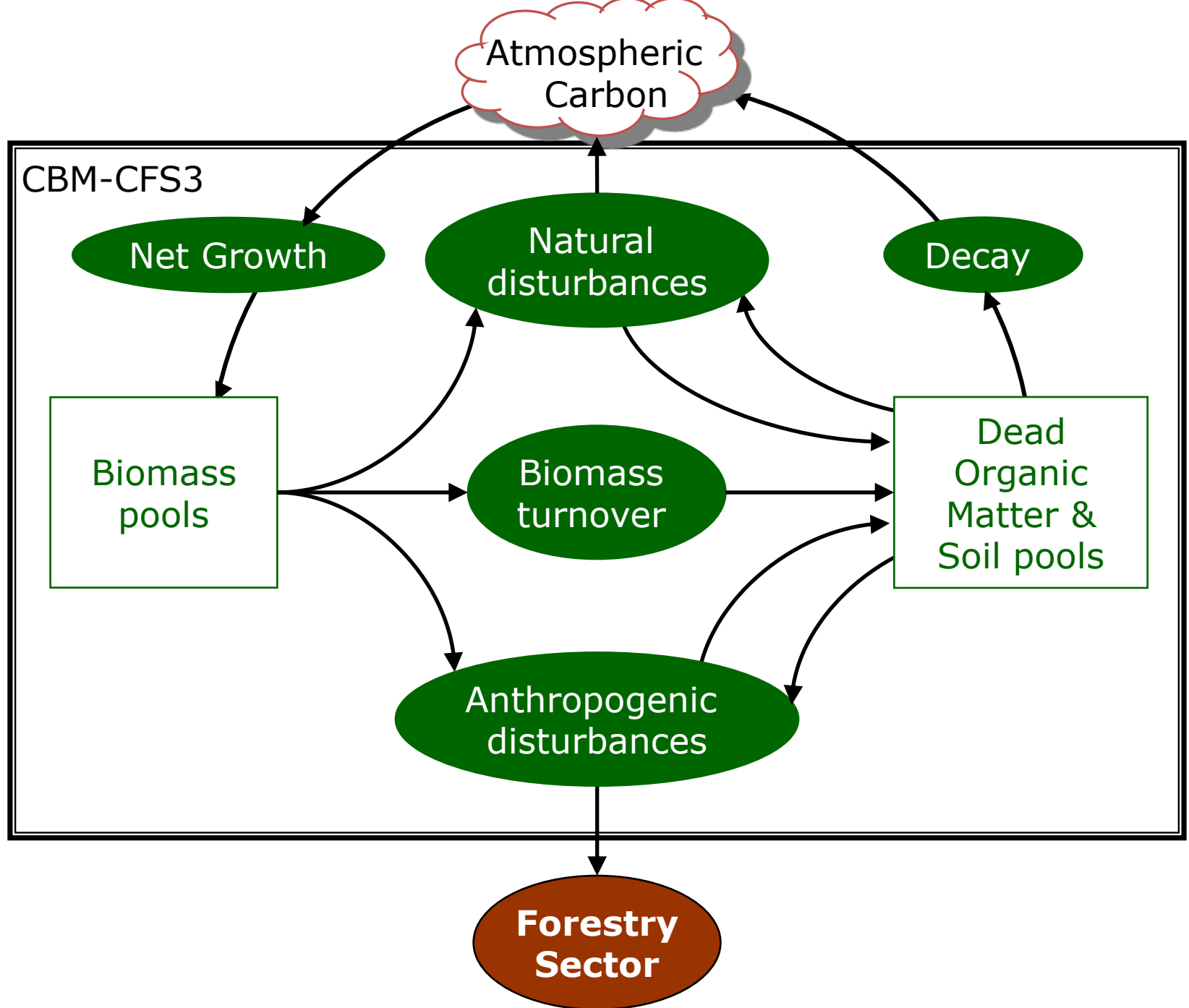
- Aggregation of BC's forest inventory and yield curves
- Recent fire history data used to parameterize annual area burned function.
- Recent temperature data drives decay rates
- One mountain pine beetle future
- One future harvest
- 12 climate change scenarios
- Growth rate recent, decreasing or increasing
- Decay rate recent or increasing with forecast temperature
- Annual area burned recent or increasing x 100 random futures

Changes



Changes

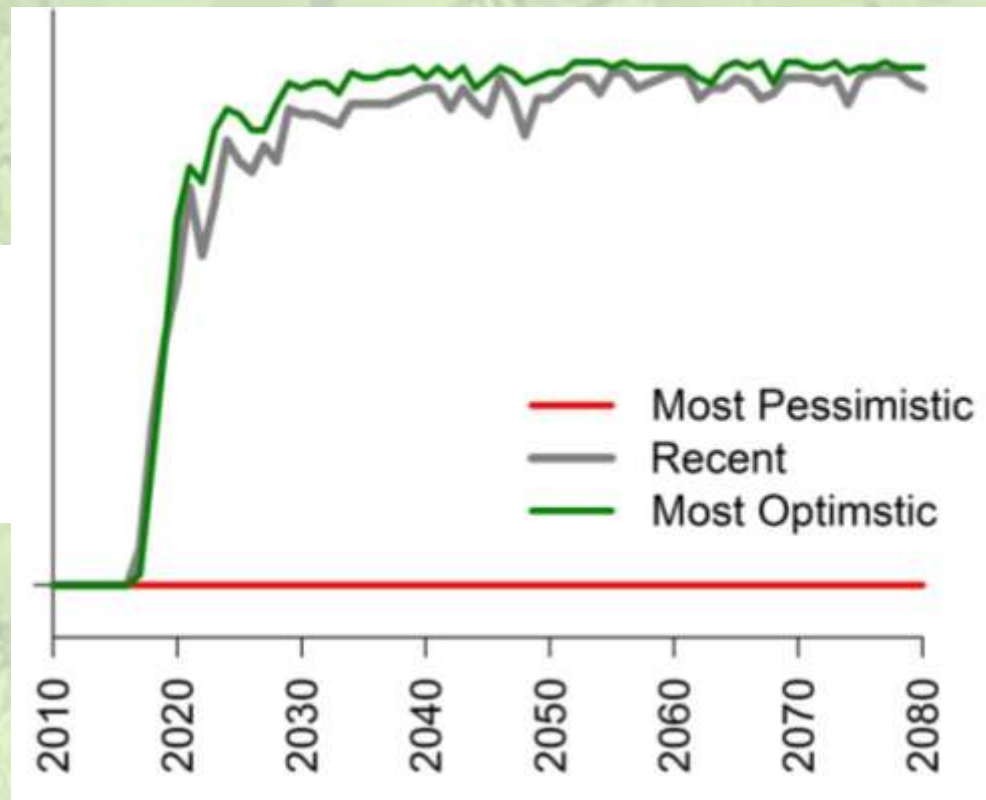




Impacts on carbon

- Assumed that half the harvested wood is stored and the remaining emitted,
- The most optimistic scenario has a high proportion of simulations as an annual sink in 2020 and beyond.
- The most pessimistic does not estimate an annual sink by 2080

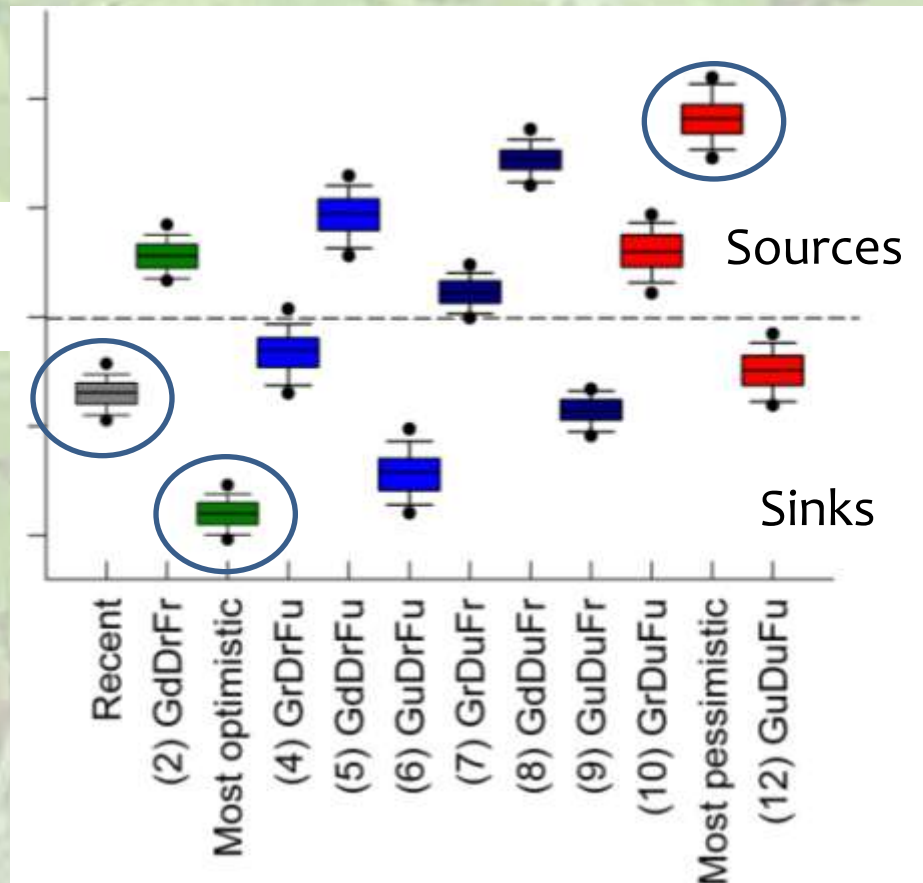
Proportion of
random fire
simulations with
a C sink



Impacts on carbon

- Assumed that half the harvested wood is stored and the rest emitted,
- A future based on the past is estimated to be a cumulative sink
- Scenarios with increased growth are estimated as sinks
- Increased decay alone was enough to move estimate to source

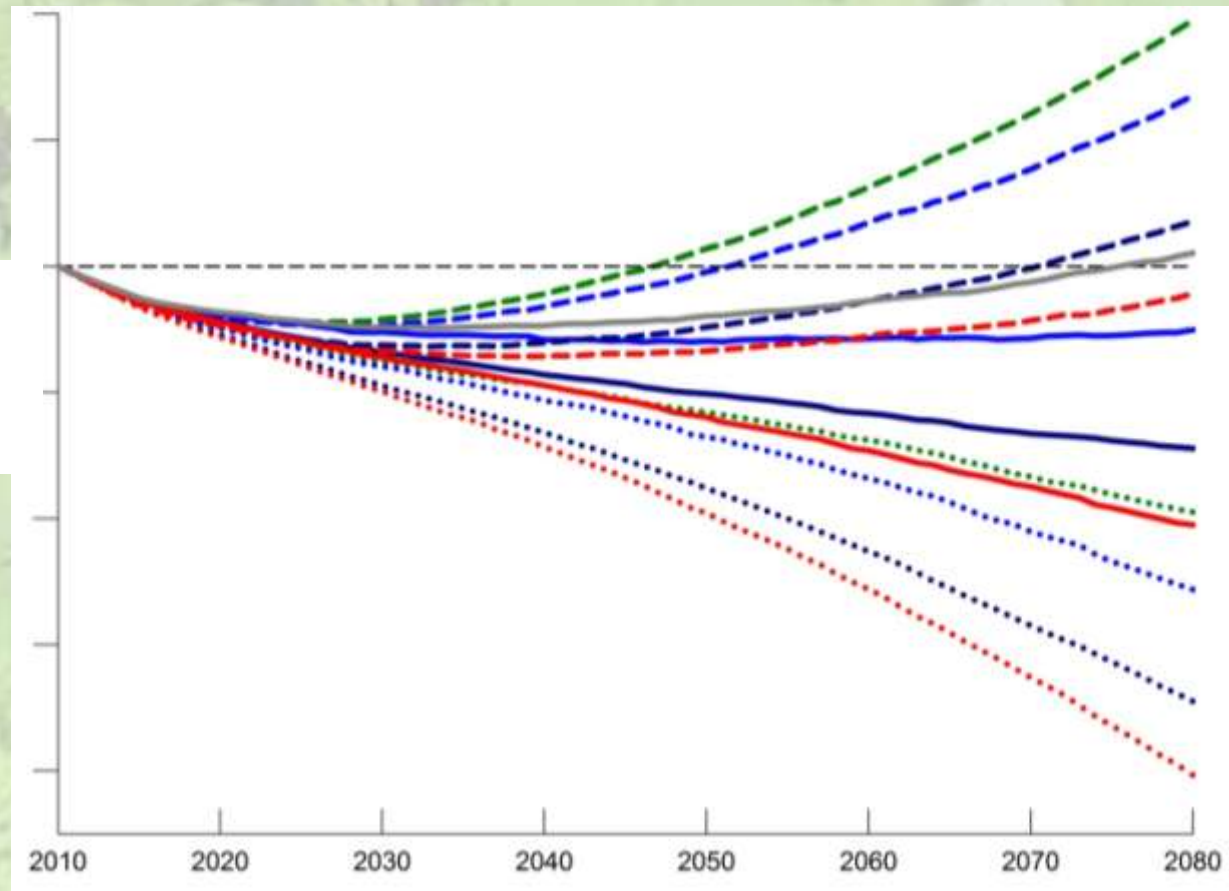
Cumulative 2010-
2080 C flux



Impacts on carbon

- Range of future ecosystem stocks 2010 level is large
- Most scenarios show a decrease
- Urgent need to improve our understanding

Proportion of
carbon stocks
relative to 2010



Recent

How can we improve on the modelling?

- Focus on a landscape
- Reduce range of changes on growth and fire by using more process-based models
- Incorporate spatial-dependencies

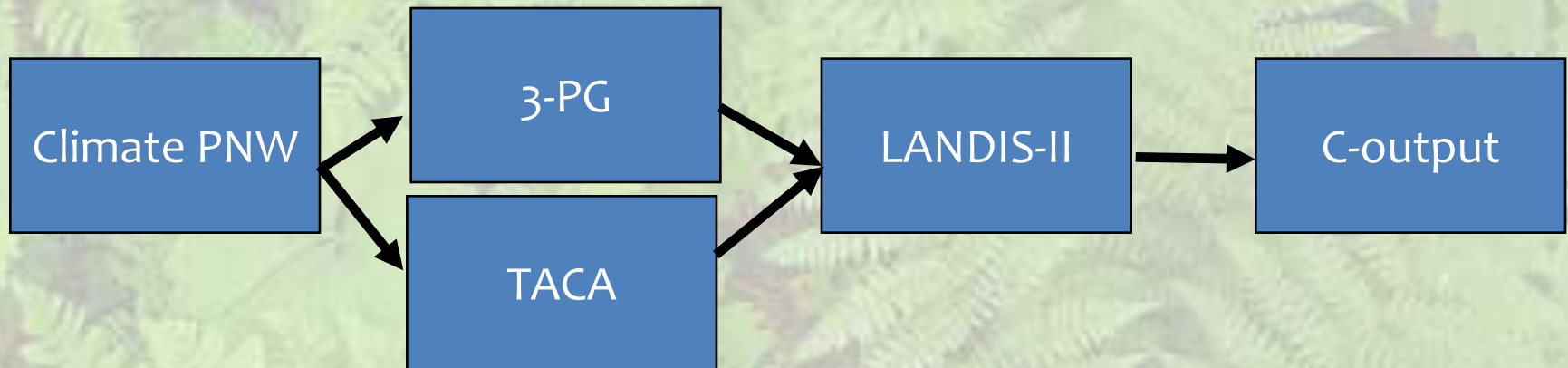
Run Forest Run by CIAgent



www.funnytimes.com

How can we improve on the modelling?

- Processed-based growth model: 3-PG
- Climate based model of natural regeneration success
- LANDIS-II
 - Climate based model of fire
 - Includes harvesting
 - New C-model based on CBM-CFS3



Implications for managers

- Can't assume there's going to be a sink with any degree of certainty.
- Adaptation to maintain or improve growth rates
- Remember that we may not be able to shift the forests from a source to a sink, but we can improve on what would naturally occur



Thanks!

- Extension Note 92
- <http://www.for.gov.bc.ca/hre/topics/climate/Misconceptions.htm>
- Carbon.cfs.nrcan.gc.ca

