



Klimaanpassung und Walderhalt

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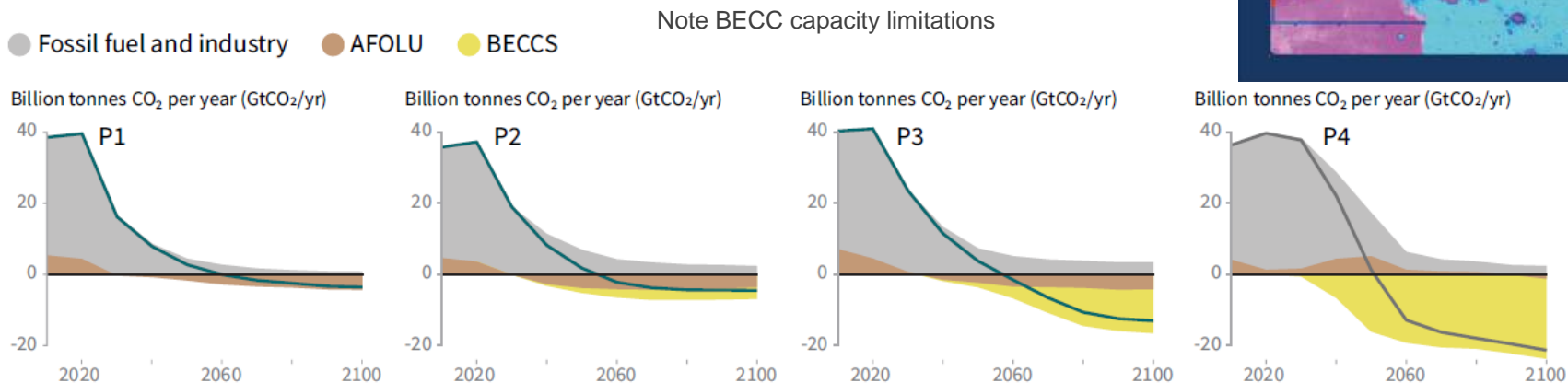
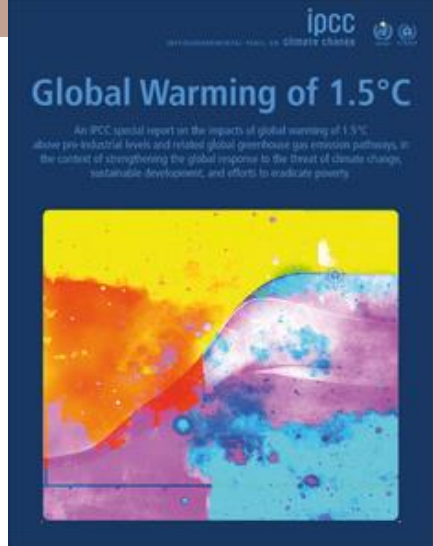
November 5th 2020

We cannot keep global warming below 2 °C without land sector contributions

- **Net negative emissions** are required later this century:
CO₂ removals from the atmosphere must be greater than emissions.
- Government expectations are high that the land sector will contribute these removals.

IPCC SR1.5

Emissions must be reduced and land sinks must be increased.
 Delays in emission reduction will increase required future land sinks
 This further increases the demand for land ...



**Bioenergy Plantations
 Land Demand (Mha)**

22

93

283

724

~ 95 % of US (lower 48 states)

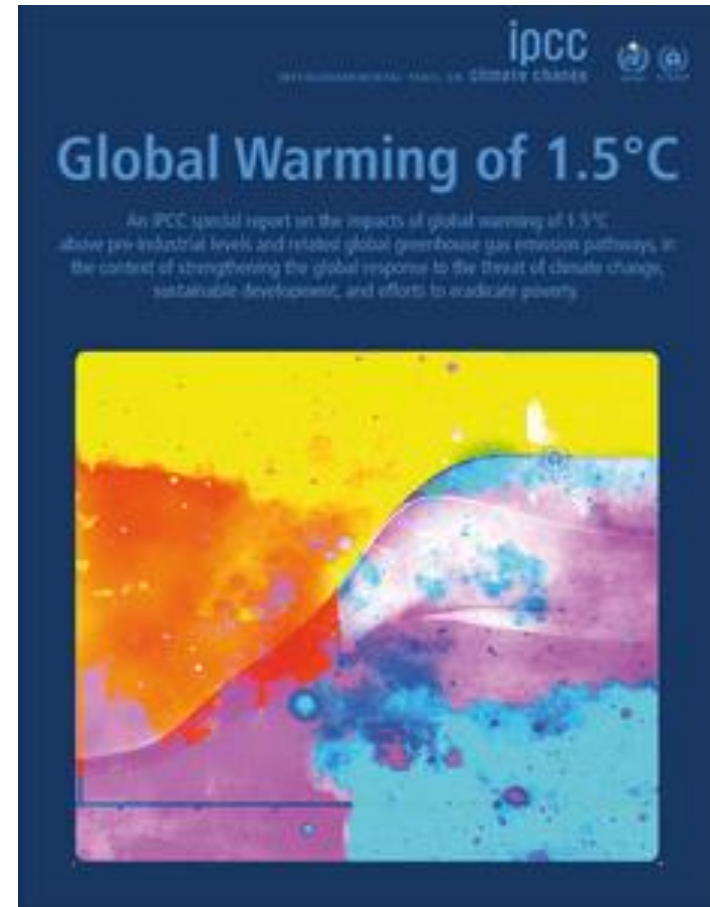
IPCC SR1.5

Every tonne of GHGs matters

Every year matters

Every degree of warming matters

We still have choices ...



Source: IPCC Special Report 1.5 Degrees

IPCC SRCCL

Identified risks, opportunities & synergies for carbon removal through land sector

Impacts on desertification, degradation and food security

Benefits of sustainable land management

Not all activities require land

Expected future land sinks must not become an excuse to avoid reducing fossil fuel emissions now.

<https://www.ipcc.ch/report/srccl/>

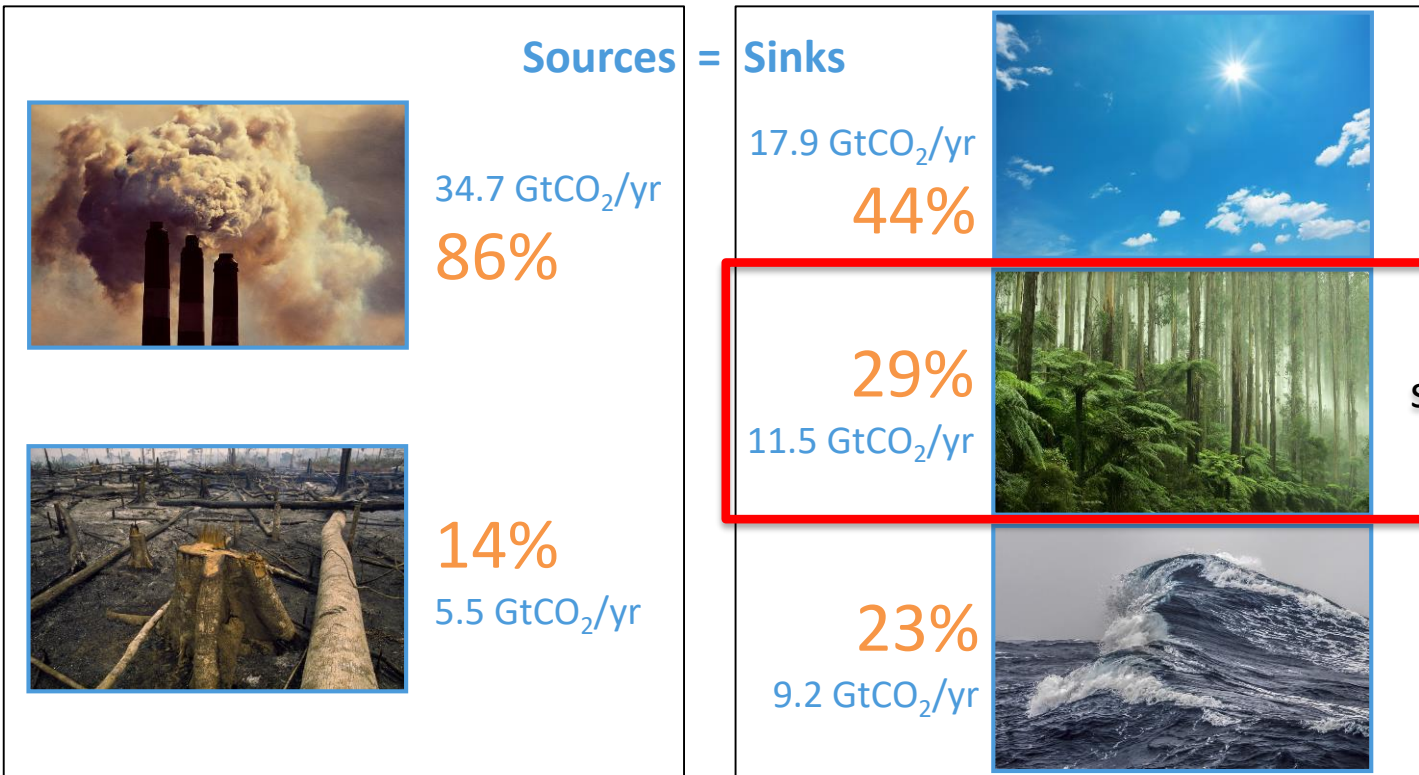
Climate Change and Land

An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems

Summary for Policymakers



Fate of anthropogenic CO₂ emissions (2009–2018)



Can sink be sustained or enhanced?

Budget Imbalance: (the difference between estimated sources & sinks) 4% 1.6 GtCO₂/yr

Source: [CDIAC](#); [NOAA-ESRL](#); [Houghton and Nassikas 2017](#); [Hansis et al 2015](#); [Friedlingstein et al 2019](#); [Global Carbon Budget 2019](#)

Climate change impacts are already felt around the world.



... and many release more GHG or change energy balance (albedo).

Climate change impacts

- Impacts of environmental changes on forests will be **both positive and negative**: growth, mortality, disturbances.
- Understanding **where, when and how** these impacts will occur is necessary to design effective climate change mitigation and adaptation strategies for the forest sector.

Climate change impacts

- Climate change impacts will be regionally-differentiated
 - Enhanced or reduced growth and mortality rates (CO₂, N, T)
 - Increased decomposition rates
 - Thawing permafrost
 - Shifting vegetation zones
 - Increased disturbances

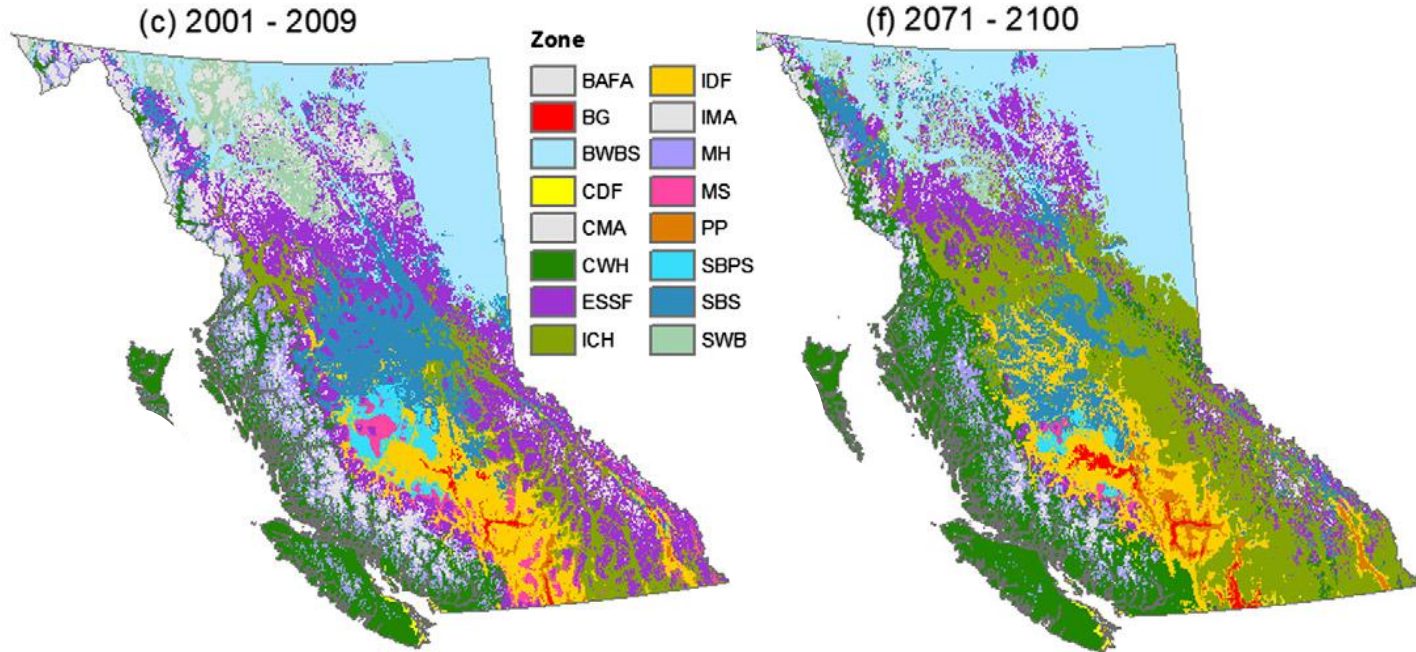
Net effects are difficult to predict



– but there is an asymmetry of risk (slow in – fast out).

Climate change will alter distribution and area of ecosystems – including transition from forest to non-forest

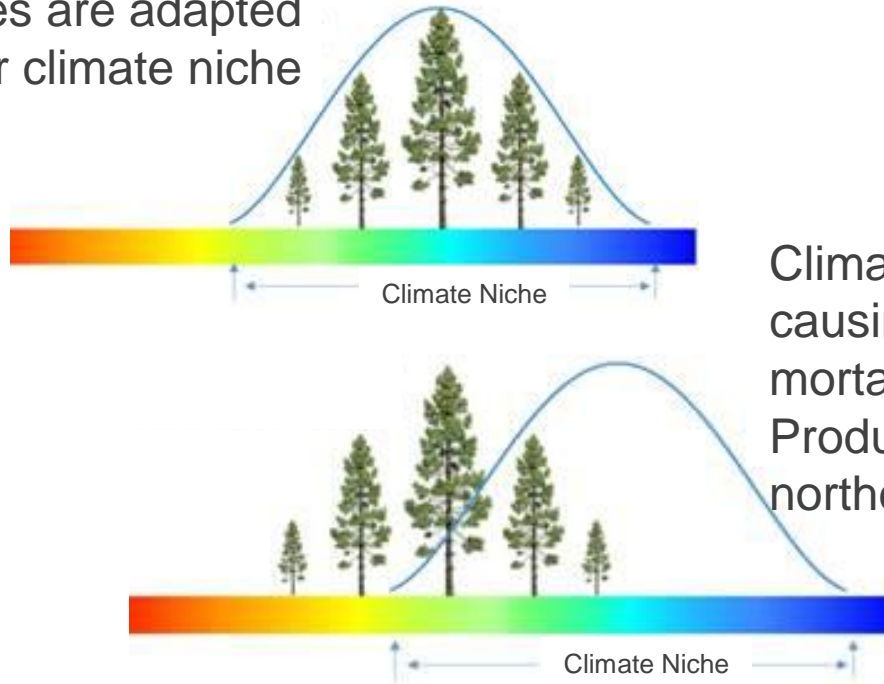
What will our responses be when millions of hectares of forest are stressed or dying?



Source: Wang et al. 2012

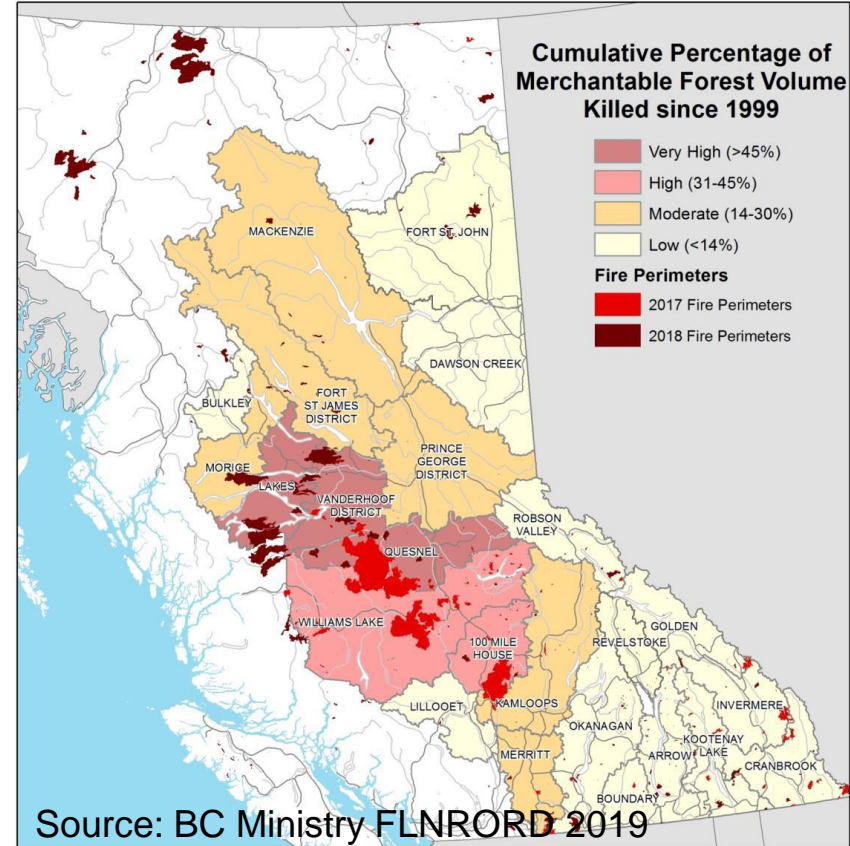
Shifting climate niches (latitude or elevation) contribute to species maladaptation, stress and tree mortality

Tree species are adapted to their climate niche

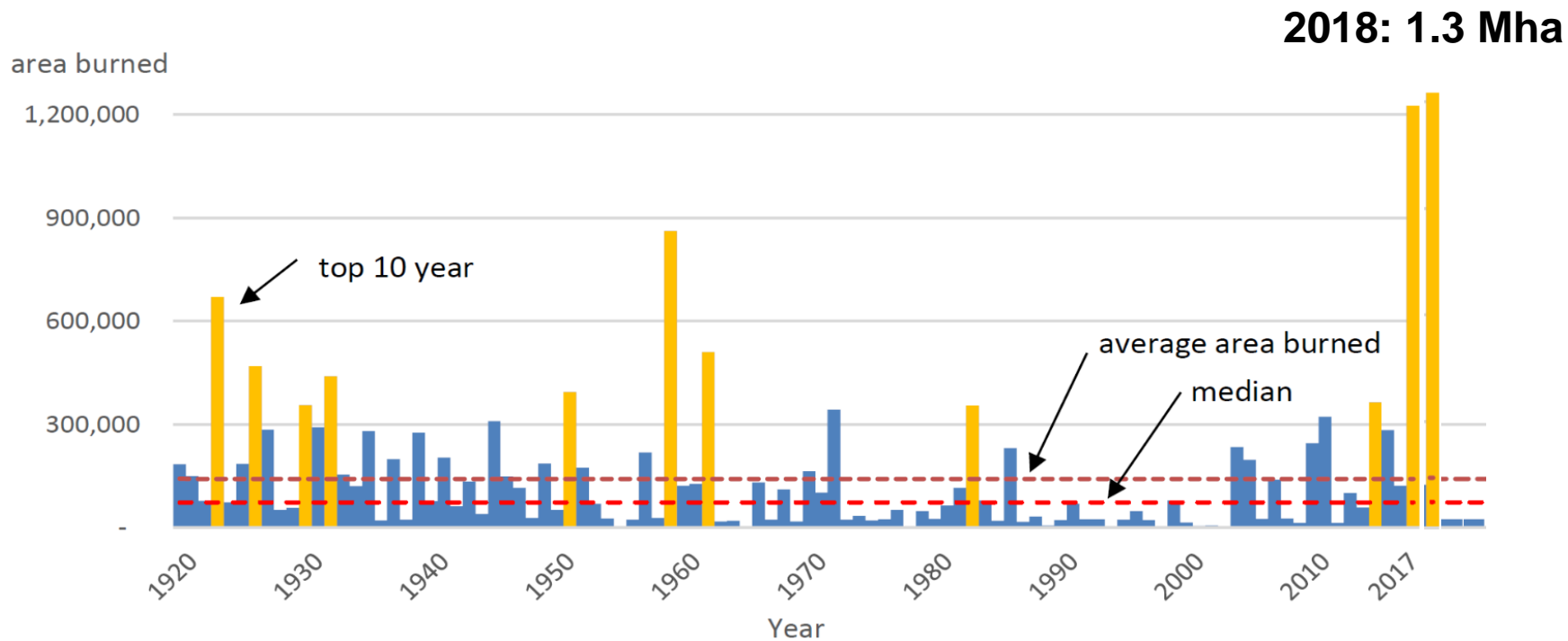


Climate change shifts niches causing maladaptation, stress and mortality.
Productivity may increase at the northern (high elevation) boundary.

Climate change impact spiral: Drought/heat, stress, insects/diseases, fires, ... ?

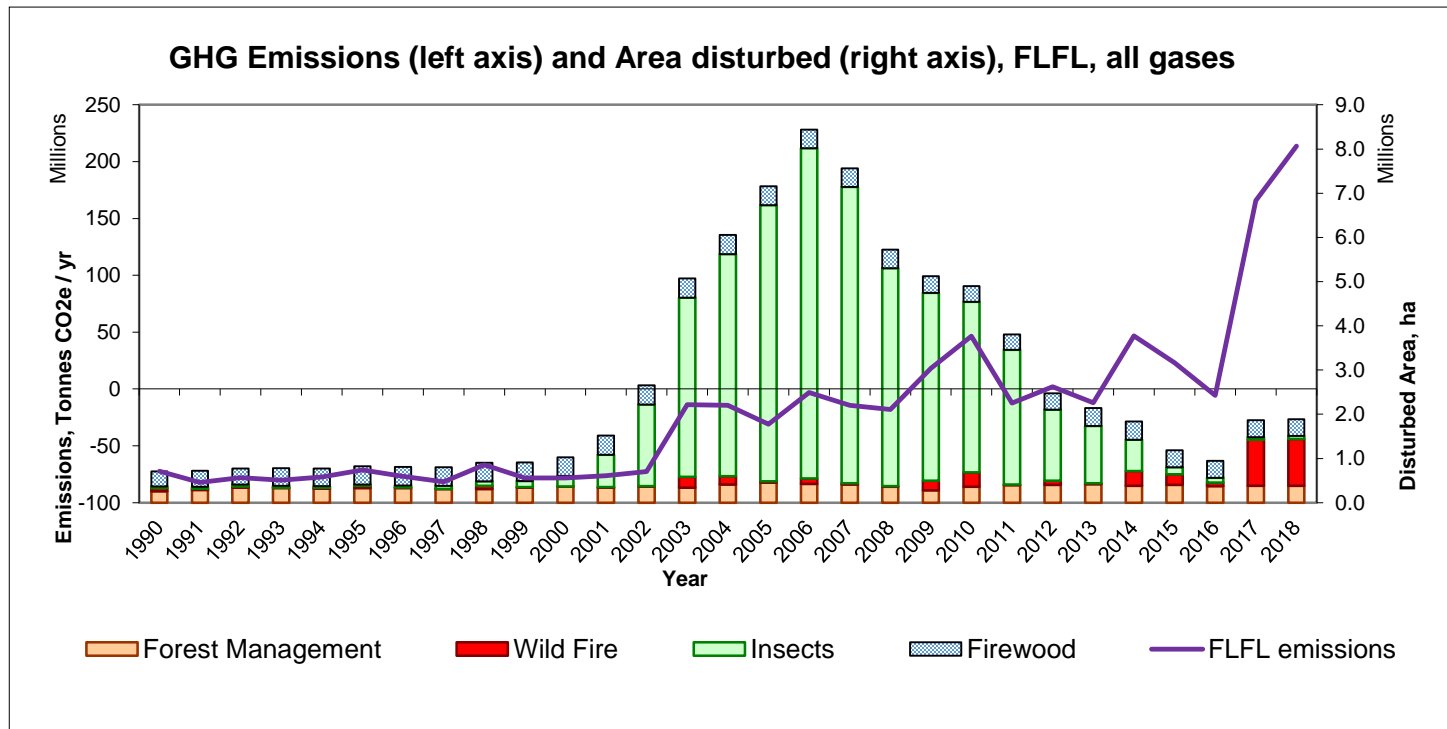


Area annually burned in British Columbia in 2017: 1.2 Mha



Source: BC Ministry FLNRORD 2018 (updated)

Annual BC Forest GHG Balance and its drivers 1990 - 2018



FL-FL = Forest land remaining forest land, Harvested wood product emissions not included

In British Columbia, 2017 and 2018 annual direct wildfire emissions estimated at ~200 Mt CO₂e or 3 times the emissions from all other sectors



Climate change impacts: 2020 forest fires

Australia: 24 Mha of which 7.5 Mha in temperate forest,
emissions 940 Mt CO₂e

Russia: >14 Mha, 244 Mt CO₂e

California: ~ 2.2 Mha, >90 Mt CO₂e

OR, WA, CO – fires still burning ...

These 2020 wildfire emissions alone > 1.2 Gt CO₂e

Wildfire risks will further increase with climate change

Conclusions

- Climate change is already affecting forests around the world.
- Keeping temperature increase to below 2 °C requires **net negative emissions** before 2100, within the **lifetime** of children born today!
- Requires **drastic reductions of emissions** in all sectors.
- Not achievable without also greatly increasing **forest sinks** but these are **at risk** from climate change.

Conclusions

- Forest management aimed at **climate change mitigation and adaptation** is needed to sustain and enhance sinks.
- Active management of forests to **support the transition to desired future conditions** will be required – supported by the best possible science and with ongoing monitoring of outcomes.
- **We still have options** – but the longer we delay action, the more severe the consequences will be.



Thank you!

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Publications at:

<https://cfs.nrcan.gc.ca/authors/read/13977>



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