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EVERYTHING YOU NEED TO KNOW ABOUT CARBON AND FORESTRY

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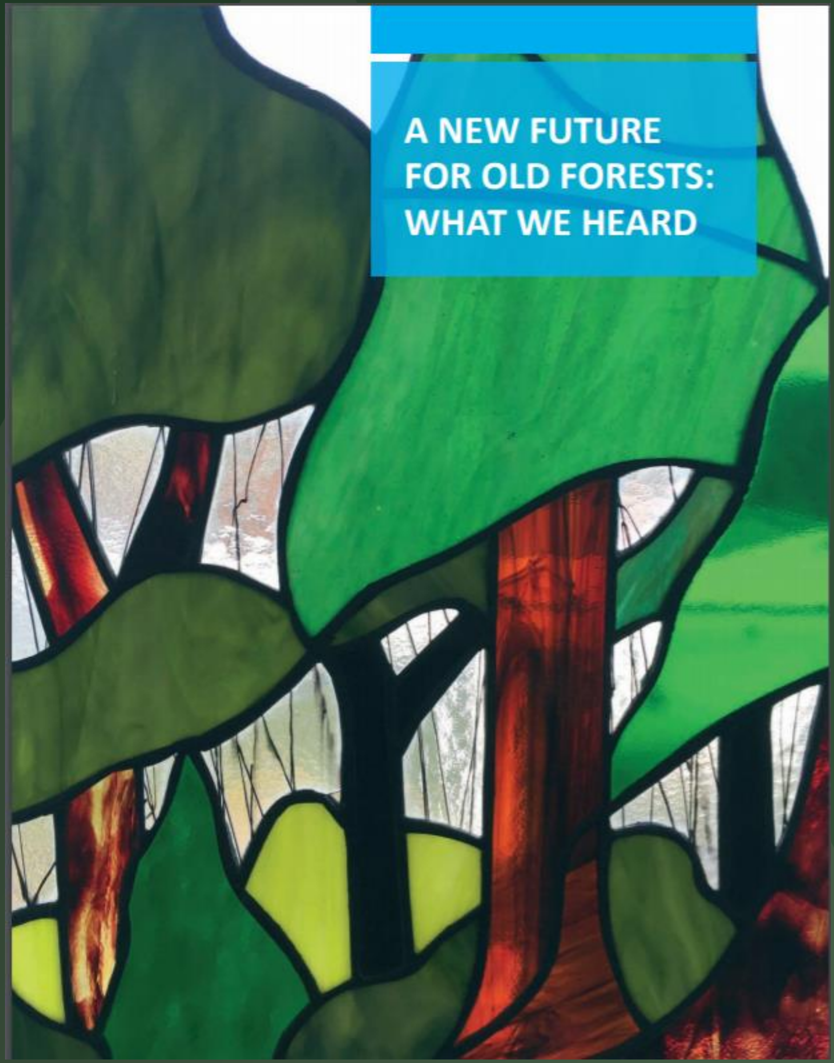
FORESTRY
AND CARBON
IN BC
DR. JIM POJAR

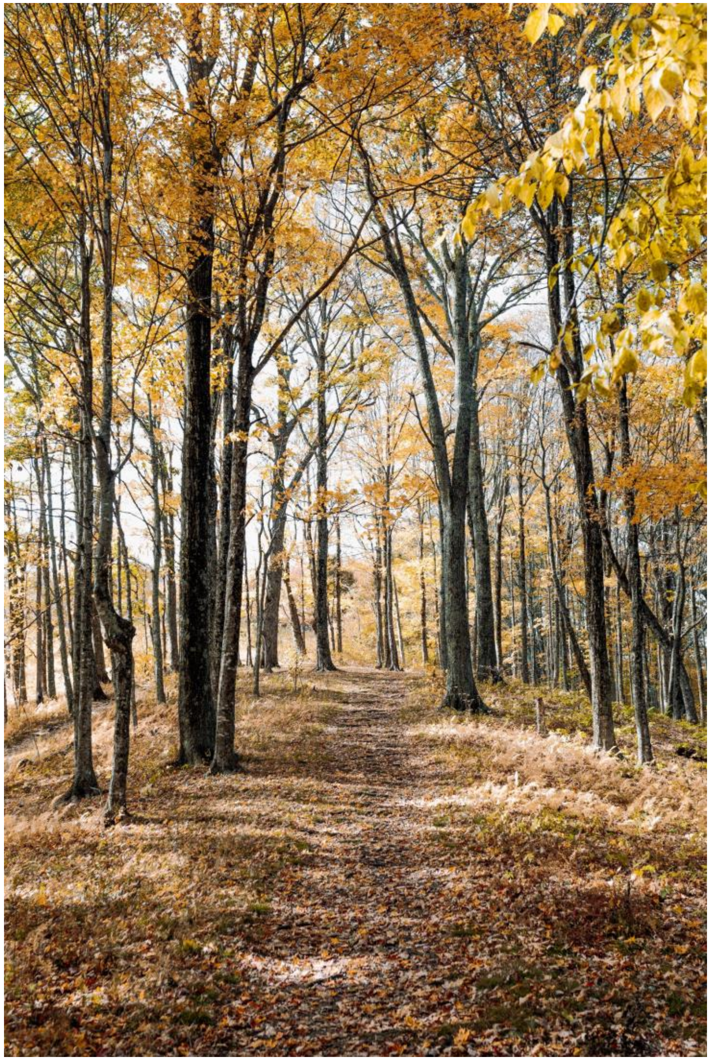

A NEW FUTURE
FOR OLD FORESTS:
WHAT WE HEARD

OUTLINE

- Stand age and carbon sequestration
- Carbon cycle in forests
- Substitution effects
- CSA net carbon uptake indicator

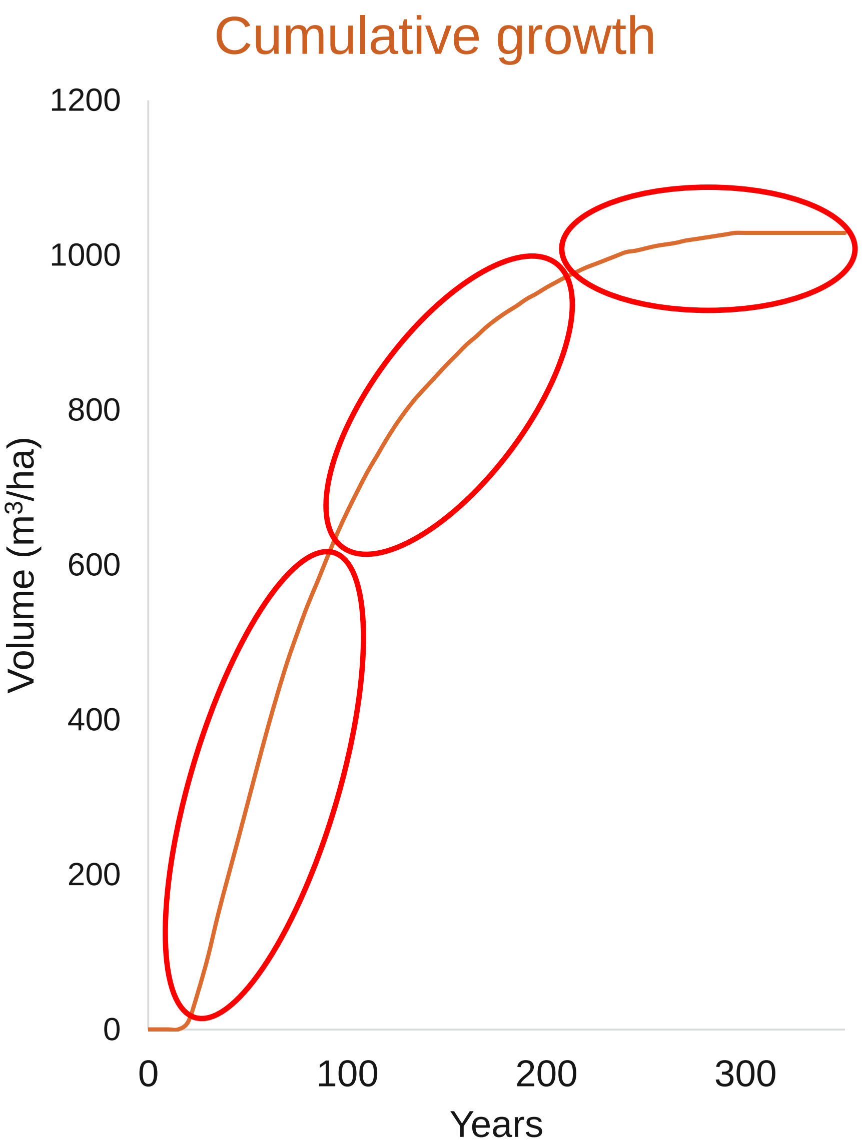
BACKGROUND

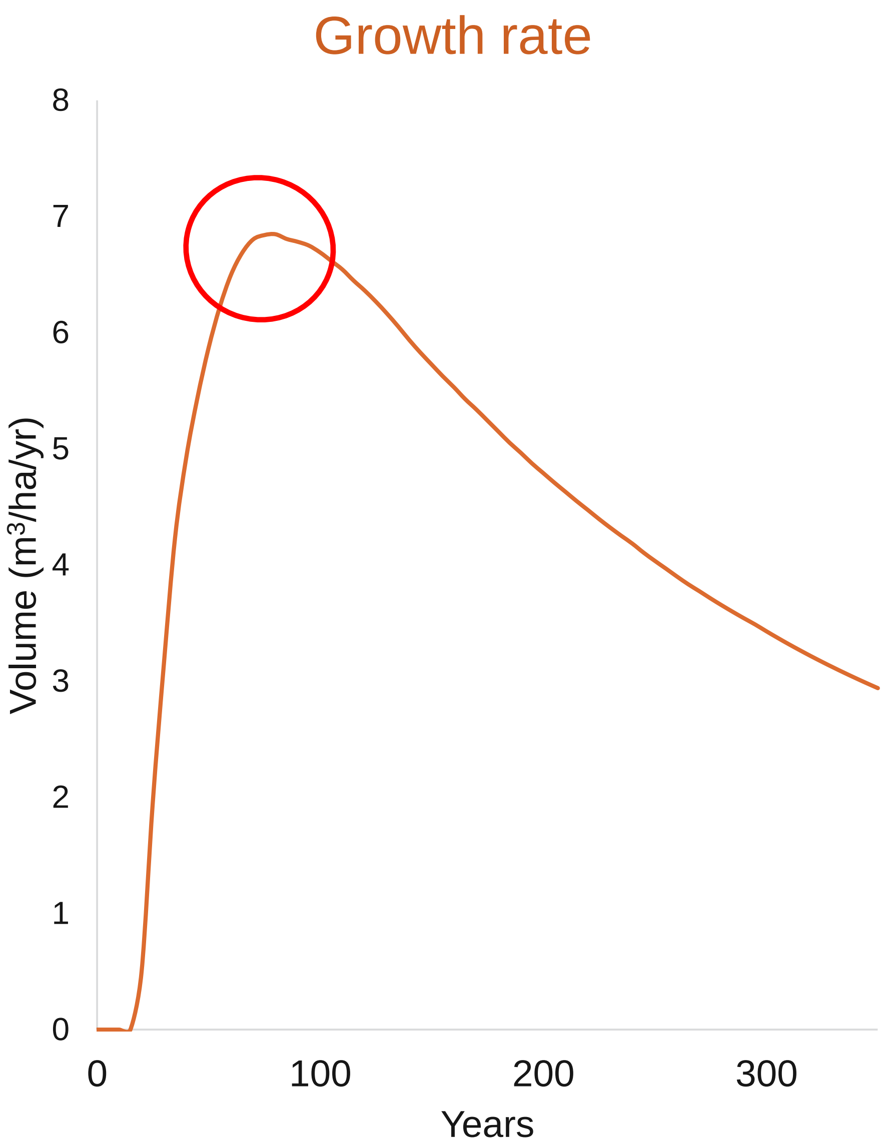
- Live, growing forests take in carbon dioxide (CO_2) through photosynthesis[1]
- Forests are carbon sinks when they take in more carbon dioxide than they emit
- Forests absorbed 25% of annual CO_2 emissions at a global scale[2]



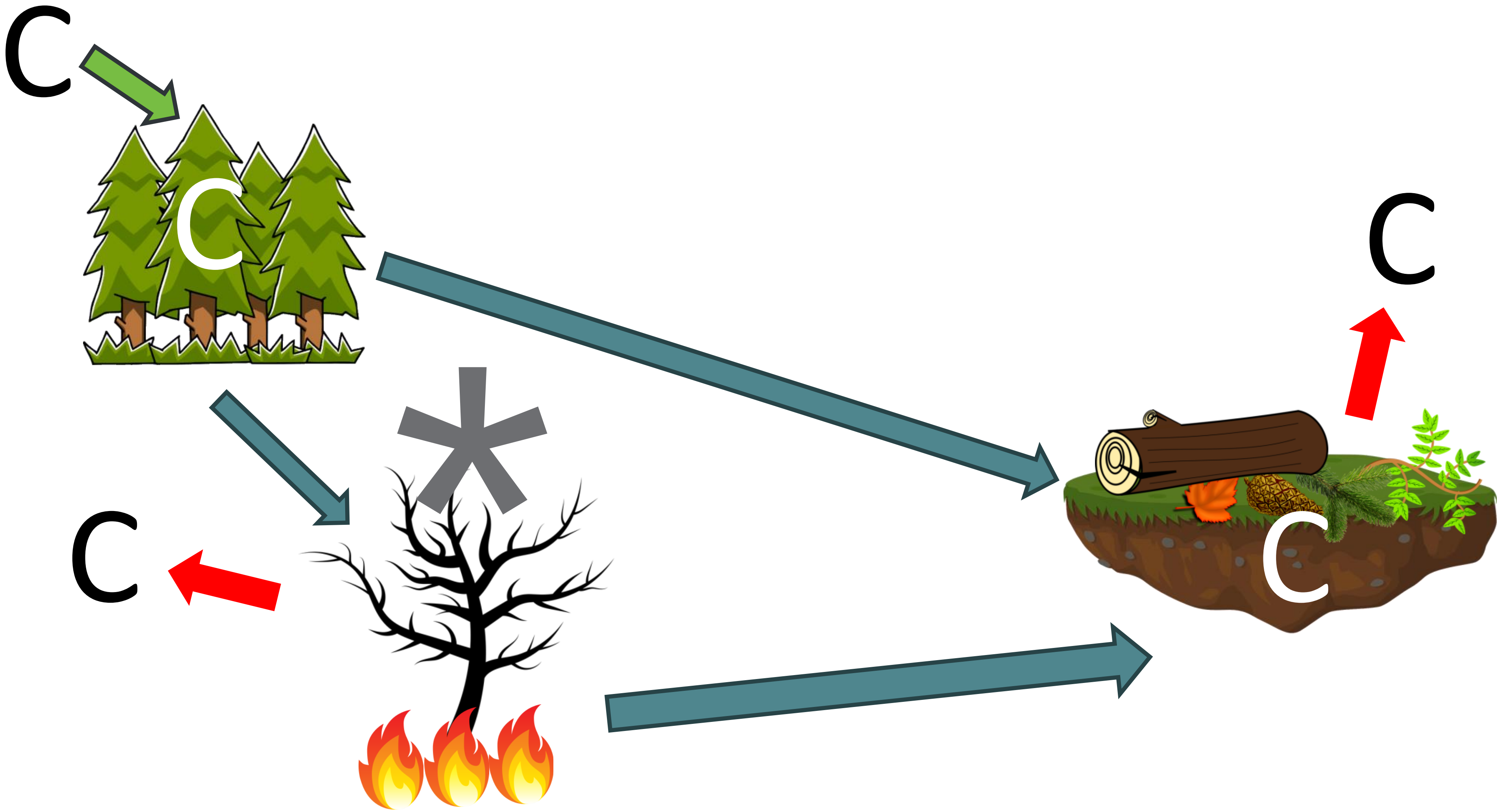
1. Dymond, C. C., and D. L. Spittlehouse. 2009. Forests in a carbon-constrained world. B.C. Ministry of Forests and Range Forest Science Program Extension Note. Victoria, B.C
2. Natural Resources Canada. 2016. Forest Carbon. Government of Canada. http://www.nrcan.gc.ca/forests/climate-change/forest-carbon/13085

STAND AGE AND CARBON SEQUESTRATION





FOREST ECOSYSTEM CARBON CYCLE



*PROTECTED OLD STANDS

CARBON SINK OR CARBON SOURCE?

*PROTECTED OLD STANDS

IT DEPENDS!

*PROTECTED OLD STANDS

- Forest ecosystem is dynamic
  - Mortality > regeneration= source[3]
  - Mortality < regeneration = sink
  - Mortality = regeneration = neutral
- Changing climates could vary disturbance regime[4]
- Ideal stand to meet carbon objectives[5,6]
  - Multi-aged
  - Historically low natural disturbance regime
  - Low vulnerability to future disturbances

3. Luyssaert, S., E. –D. Schulze, A. Börner, A. Knohl, D. Hessenmöller, B. E. Law, P. Ciais, and J. Grace. 2008. Old-growth forests as global carbon sinks. Nature 455: 213 – 215.
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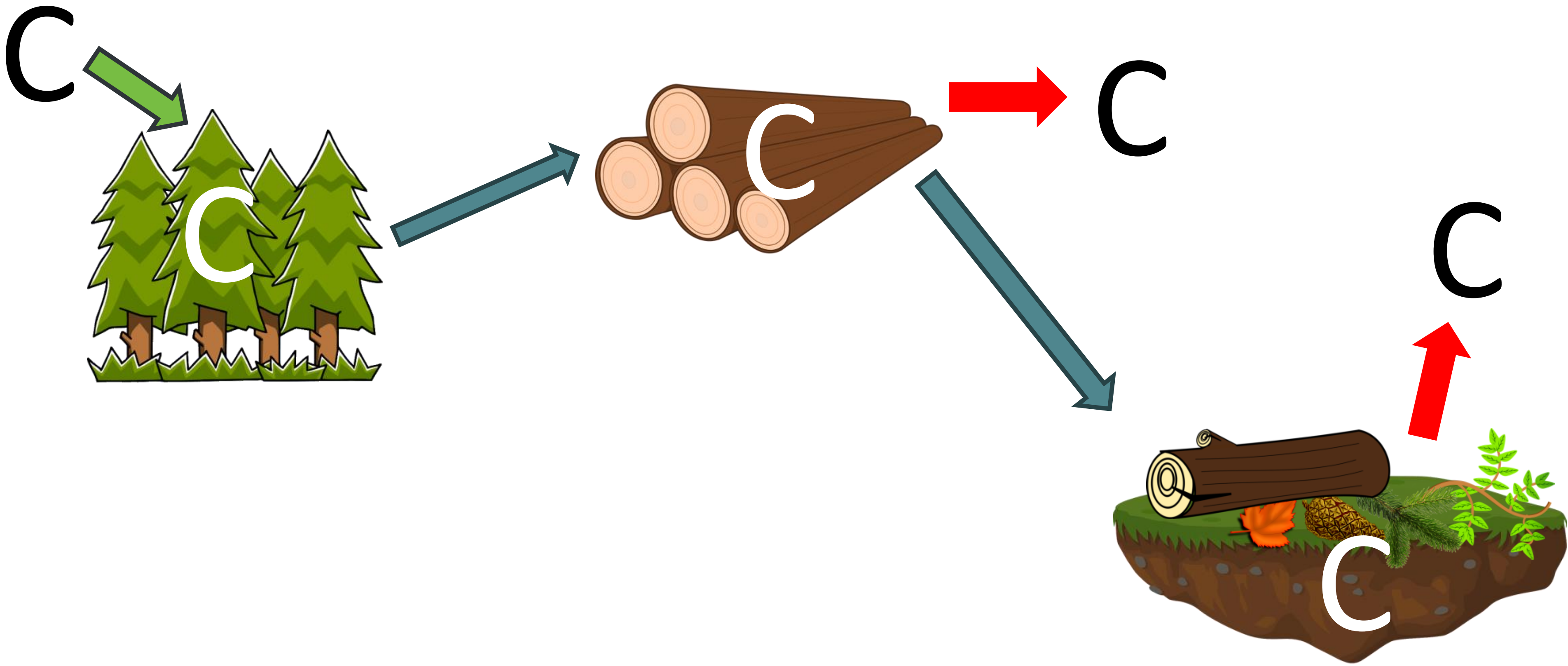
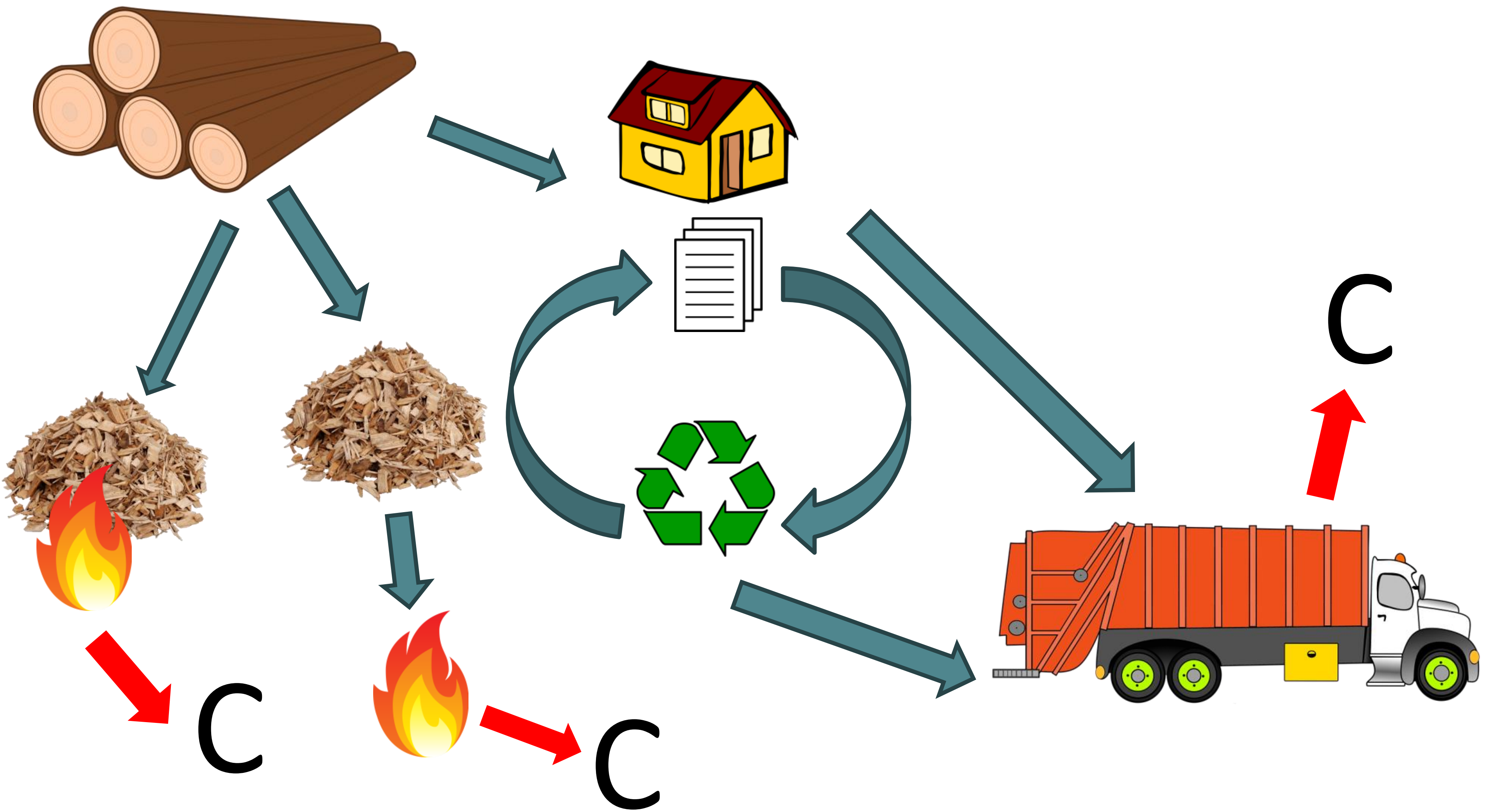
5. Shu, S., W. Zhu, W. Wang, M. Jia, Y. Zhang, and Z. Sheng. 2019. Effects of tree size heterogeneity on carbon sink in old forests. Forest Ecology and Management 432: 637 – 648. 10.
6. Volkova, L., S.H. Roxburgh, C.J. Weston, R.G. Benyon, A.L. Sullivan, and P.J. Polglase. 2018. Importance of disturbance history on net primary productivity in the world's most productive forests and implications for the global carbon cycle. Global Change Biology 24: 4293 – 4303.

FOREST ECOSYSTEM CARBON CYCLE



HARVESTED WOOD PRODUCTS CARBON CYCLE



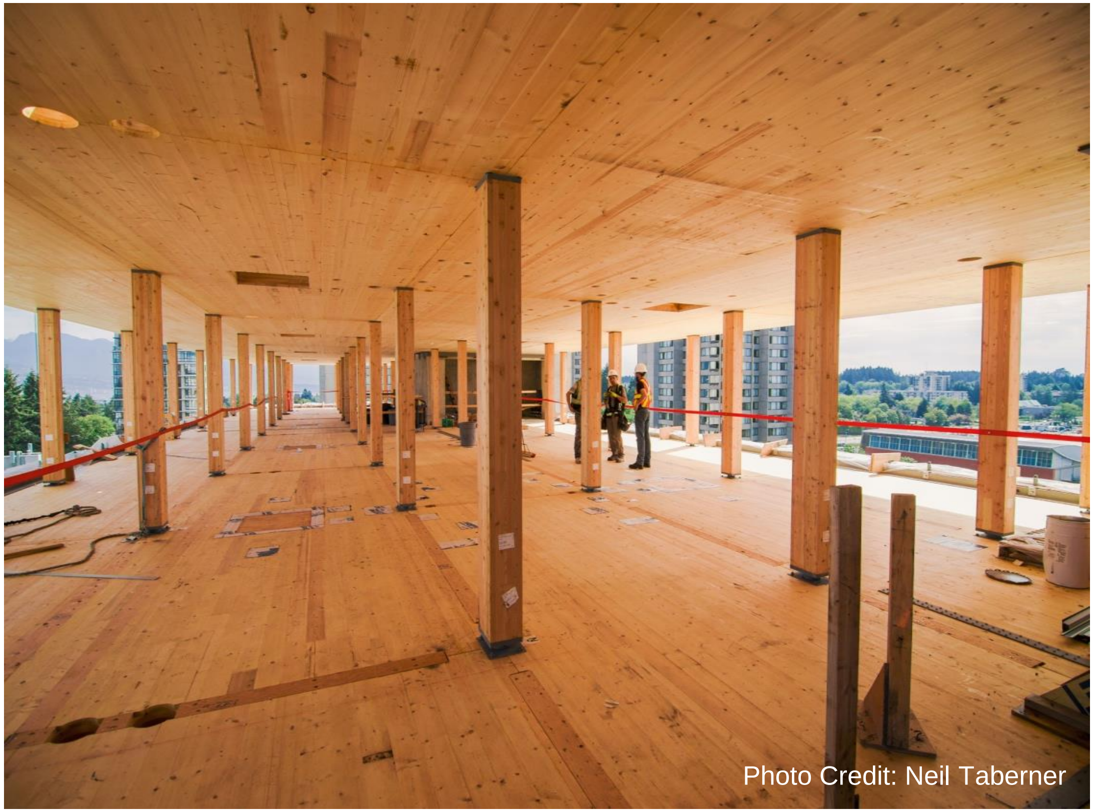
SUBSTITUTION EFFECTS

- Amount of greenhouse gas that could be avoided by using a wood product rather than another product for the same function
- Wood products have a lower carbon footprint[7]
  - Renewable
  - Less energy intensive
  - Recyclable
- 0.47-0.54tC emission avoided per tC in wood product[8]

7. Colombo, S.J. and Ogden A. 2015. Canadian Forest Products: Contributing to climate change solutions. Canadian Climate Forum. 1-8.
8. Smyth, C., Rampley, G., Lempriere, T.C., Schwab, O., Kurz, W. 2017. Estimating product and energy substitution benefits in national-scale mitigation analyses for Canada. Global Change Biology Bioenergy.

SUBSTITUTION EFFECTS

- Bioenergy beneficial[9]:
  - Sourced from residues
  - Type of processing required
  - Short commute for processing
- Avoided emissions in BC found to range from in various scenarios 0.44tC per tC in bioenergy[10]



9. Smyth, C., Rampley, G., Lempriere, T.C., Schwab, O., Kurz, W. 2017. Estimating product and energy substitution benefits in national-scale mitigation analyses for Canada. Global Change Biology Bioenergy.
10. Smyth, C.E., Xu, Z., Lemprière, T.C. and W.A. Kurz. 2020. Climate change mitigation in BCs forest sector: GHG reductions, costs, and environmental impacts. Carbon Balance Management.

WOOD PRODUCTS OR PROTECTED OLD STANDS?

WOOD PRODUCTS vs PROTECTED OLD STANDS

Protected old Stands

- Carbon storage for a very long time
  - Risk of natural disturbance
- Serves invaluable ecosystem services
  - Wildlife habitat
  - Biodiversity
  - Cultural value
  - Recreation

Wood products

- Carbon storage for a long time as harvested wood products[11]
  - Depends on what products are made
  - Substitution effect
- Harvest impacts
  - Carbon source for decades[12]

11. Smyth, C., G. Rampley, T. C. Lemprière, O. Schwab, and W. A. Kurz. 2017. Estimating product and energy substitution benefits in national-scale mitigation analyses for Canada. Global Change Biology Bioenergy.
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MONITORING CARBON – CSA INDICATORS

Indicator 4.1.1: Net Carbon Uptake

Element: 4.1 Carbon Uptake and Storage *Maintain the processes that take carbon from the atmosphere and store it in forest ecosystems.*				
Value	**Objective**	**Indicator**	**Target**	**Variance**
The uptake of carbon	The net rate of carbon uptake by the forest is positive over time	Net carbon uptake	The net annual carbon uptake on the DFA is positive	1 year negative

Year	Description	CO_2e (tonnes)	Target Met (Y/N)	Variance Met (Y/N)
2019	Carbon uptake (from growing stock TFL 44)	608,773	Y	n/a
	Carbon removed (to short-lived products1)	-188,917		
	Fuel Consumed (harvest & transport)	-6,796		
	Debris burned (debris disposal/operational fires)	-70,283		
	NET Carbon Uptake	**342,777**		

- Represents forest ecosystem carbon
- Focus on live aboveground biomass
- Harvested trees assumed to release emissions immediately
- Excludes natural disturbances

SUMMARY

- Many factors influence forest ecosystem carbon
- Protected old stands may or may not be the solution to increase carbon sequestration
- Long- term wood products provide a less risky form of carbon storage
- The optimal solution to maximize carbon in our forests involve a mix of protected and harvested stands.

Questions?

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