Life Cycle Assessment (LCA) of PNW alder sawmills:
Product and landscape level comparative assessment

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What we will cover

- **Results of Life Cycle Assessment of 3 alder sawmills; two in Washington (WA-1 & WA-2) and one in Oregon**
- **Comparative environmental assessment of solid alder cabinet door vs a common alternative**
- **Plot level and landscape level environmental assessment of alder as a natural climate solution in the PNW.**

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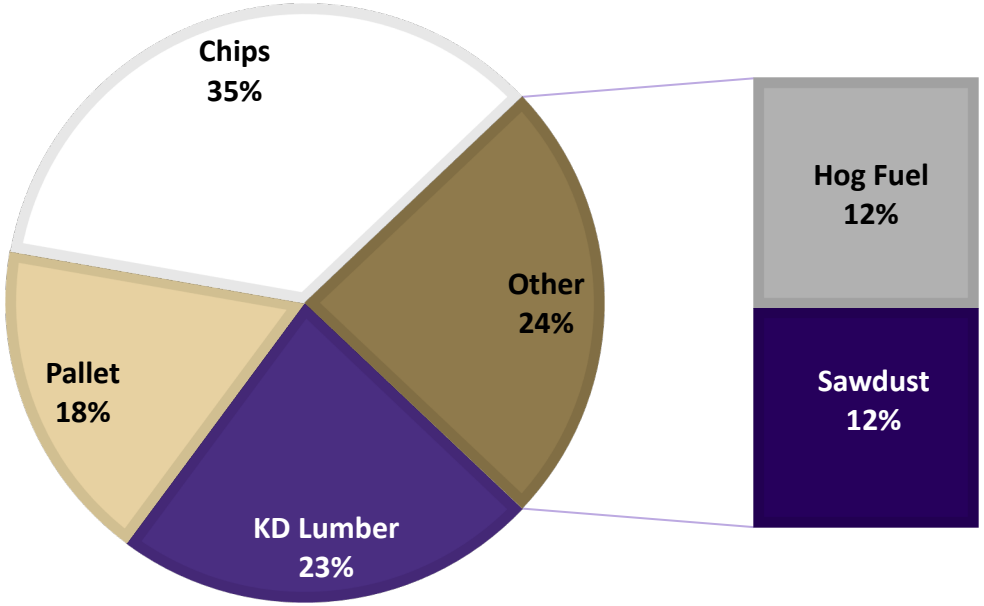
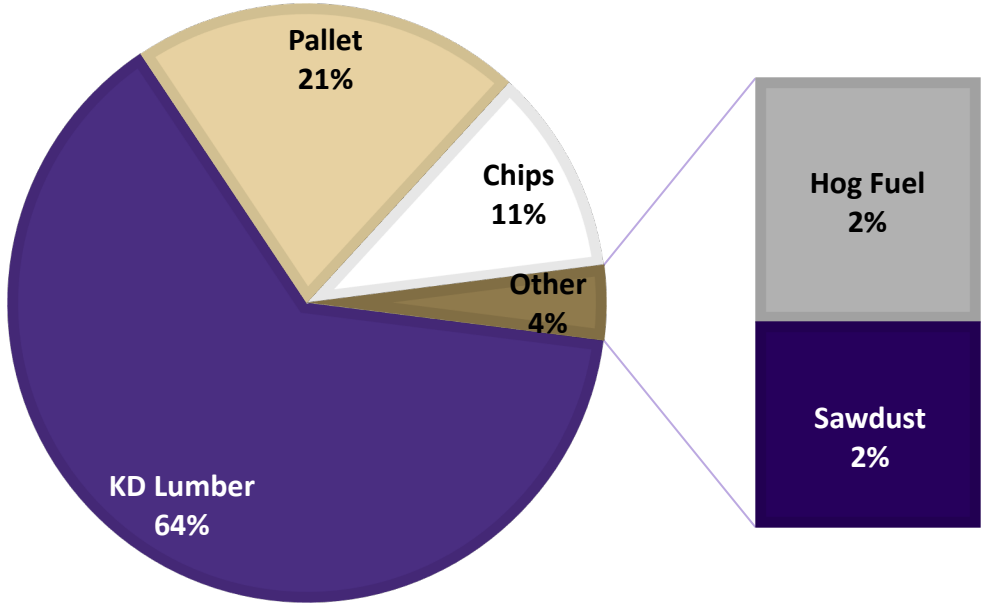
Alder Product mix relevant to LCA analyses

Mass vs Economic allocation

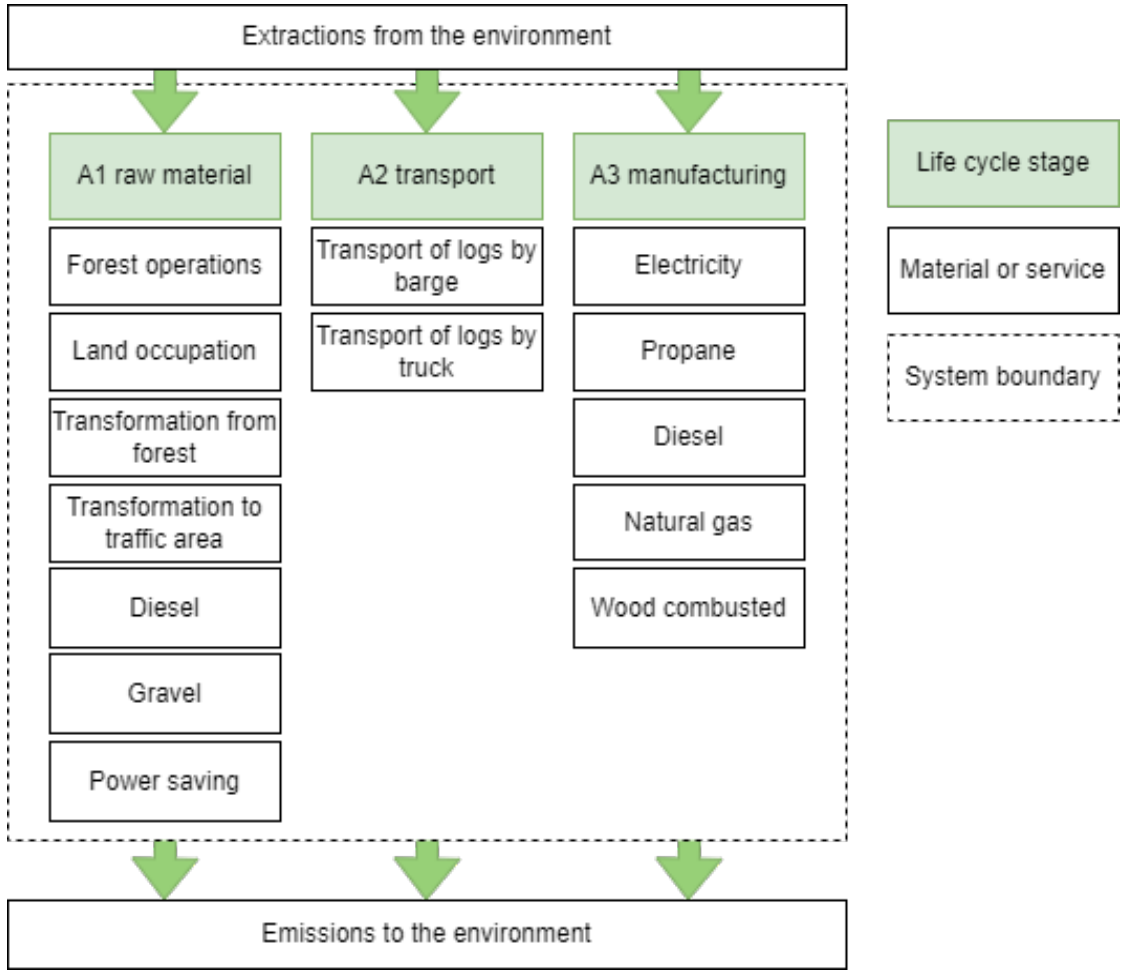
OUTPUT DISTRIBUTION BY BONE DRY WEIGHT



OUTPUT DISTRIBUTION BY REVENUE ($ VALUE)



Input and output flows



Functional unit:

1 m^3 (420 kg oven-dry) of kiln-dried, sanded alder lumber

Locations of the sawmills:

- Mill in Washington 1: WA-1 (data year: 2018)
- Mill in Washington 2: WA-2 (data year: 2018)
- Mill in Oregon: OR-1 (data year: 2020)

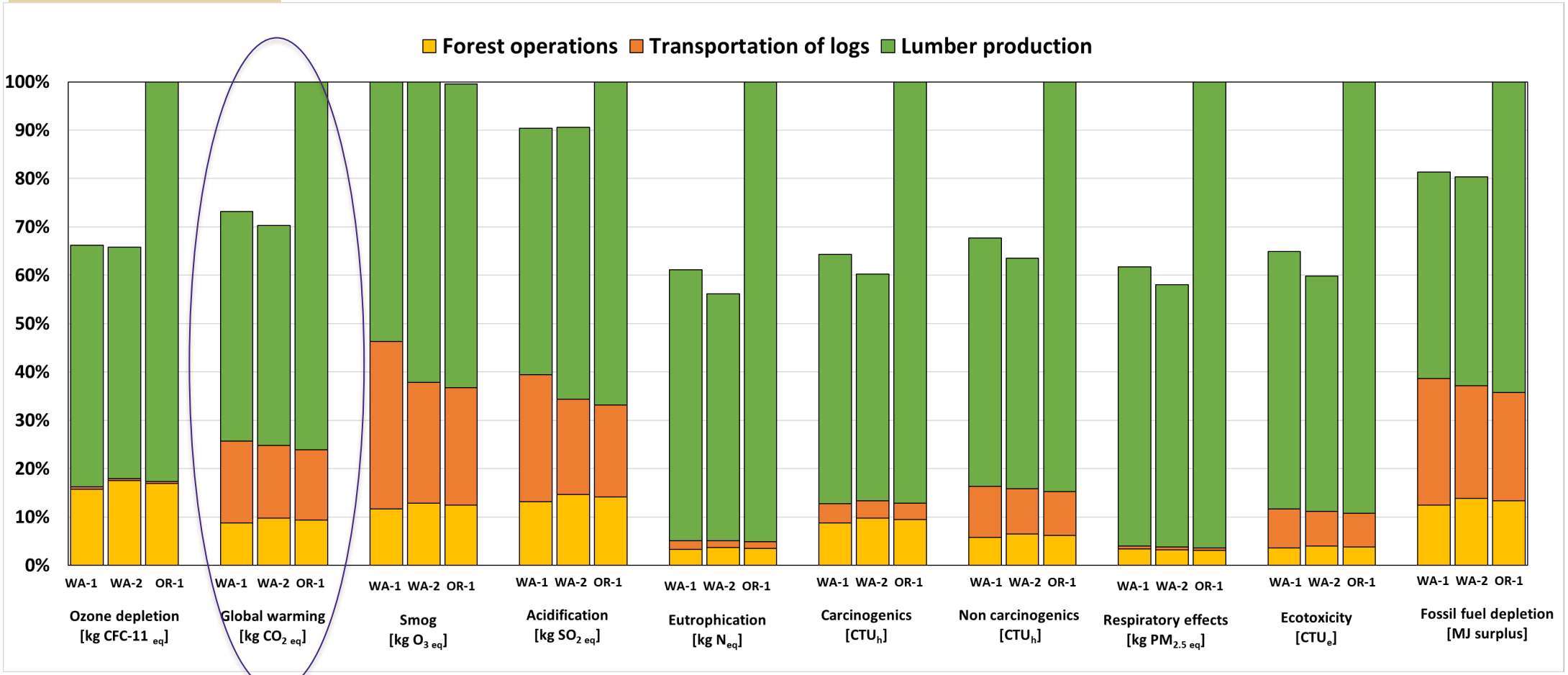
Transportation distance:

WA-2 and OR-1: red alder is sourced within 80 km from the mill and transported by truck

WA-1:

- 80% of alder is sourced within 80 km from the mill and transported by truck
- 20% of alder is sourced from British Columbia and transported by water for 402 km. It is then transported from the port to the mill by truck for 40 km.

Lumber LCA results



Key findings

- **The global warming potential (GWP) (a.k.a, embodied carbon or carbon footprint) is approximately 92 kg CO_{2eq} per m^3 of lumber, using an economic allocation.**
  - This number is significantly lower (under 40 kg CO_{2eq} per m^3 of lumber), when using a mass allocation
  - Even the economic allocation number is much lower than the national average for hardwood lumber.
- **Generally, environmental footprint of lumber (softwoods and hardwoods) produced in the PNW have lower carbon footprint:**
  - High renewable energy in the electricity mix
  - In western OR and WA, log transportation is much more efficient
- **Use of sawdust for boiler, reduces the use of natural gas and helps reduce the carbon impact**
  - Moreover, high proportion of pallet stock manufacturing reduces the kiln load

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Comparative LCA of a kitchen cabinet door produced with alder board procured from regional sawmills vs. a commonly found kitchen cabinet door

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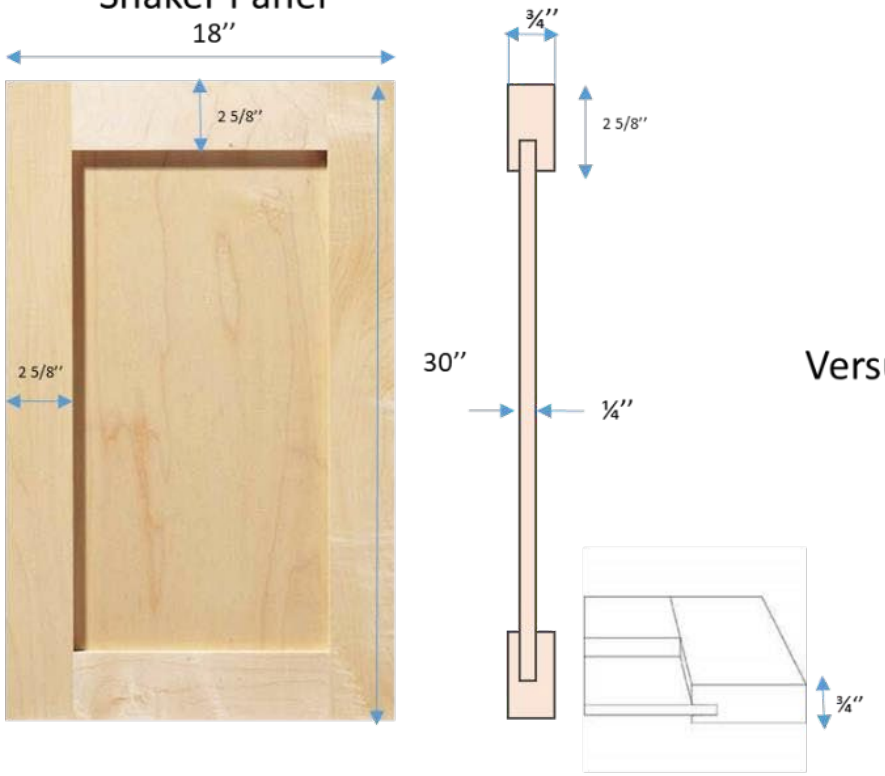
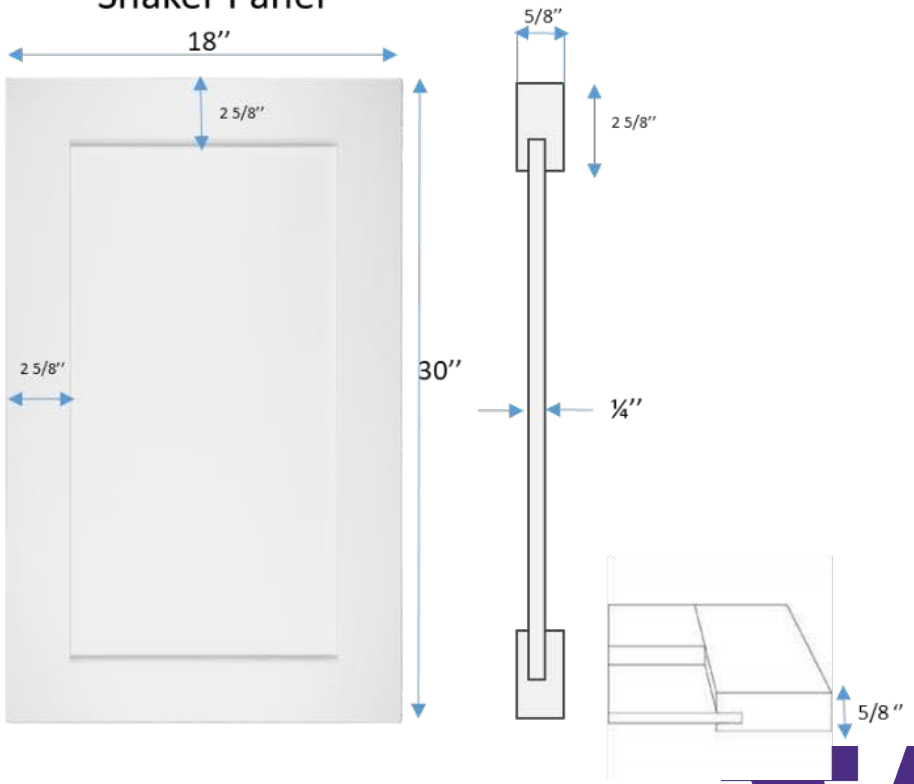
Product information

Natural Alder Finished Shaker Panel

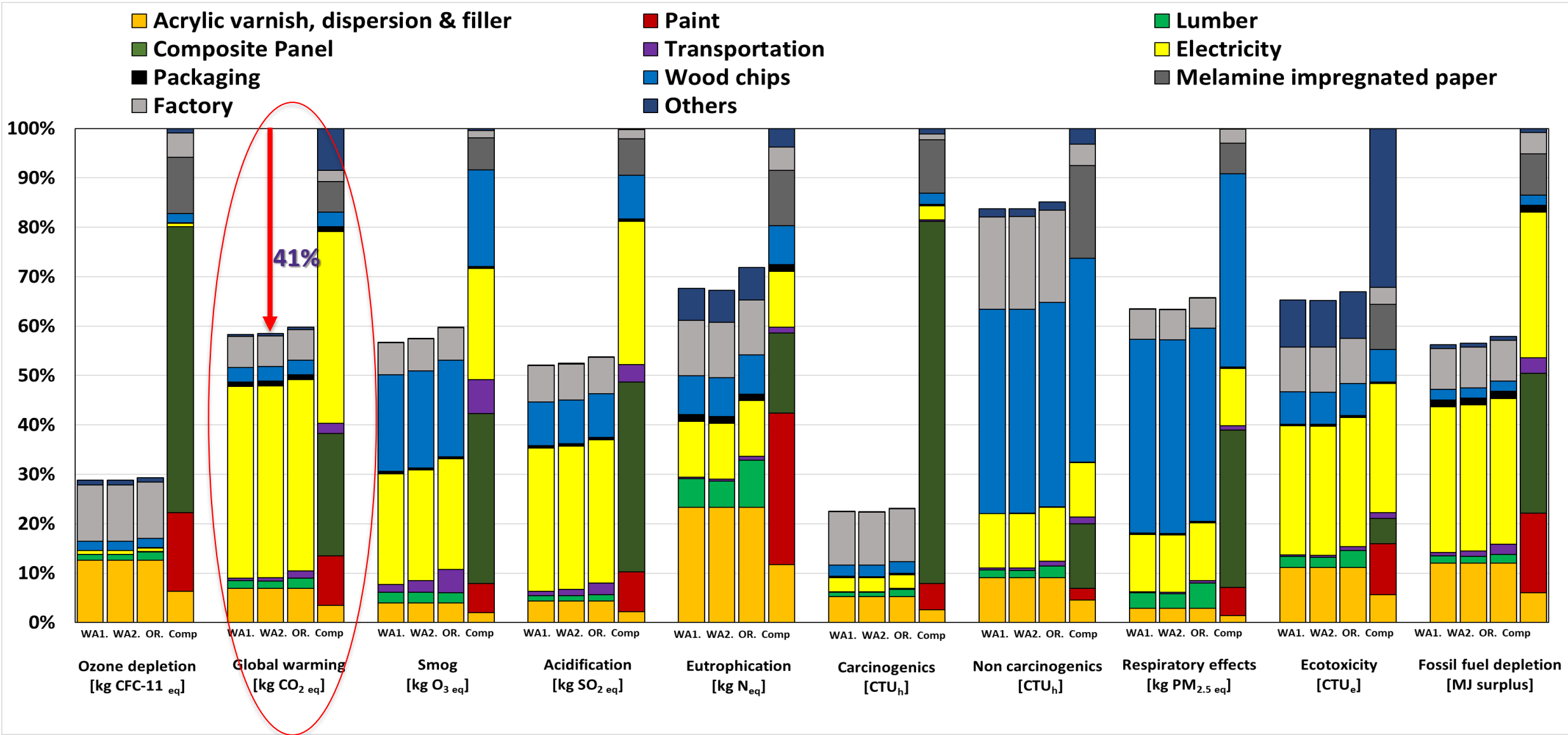


Versus

Regular White Finished Shaker Panel

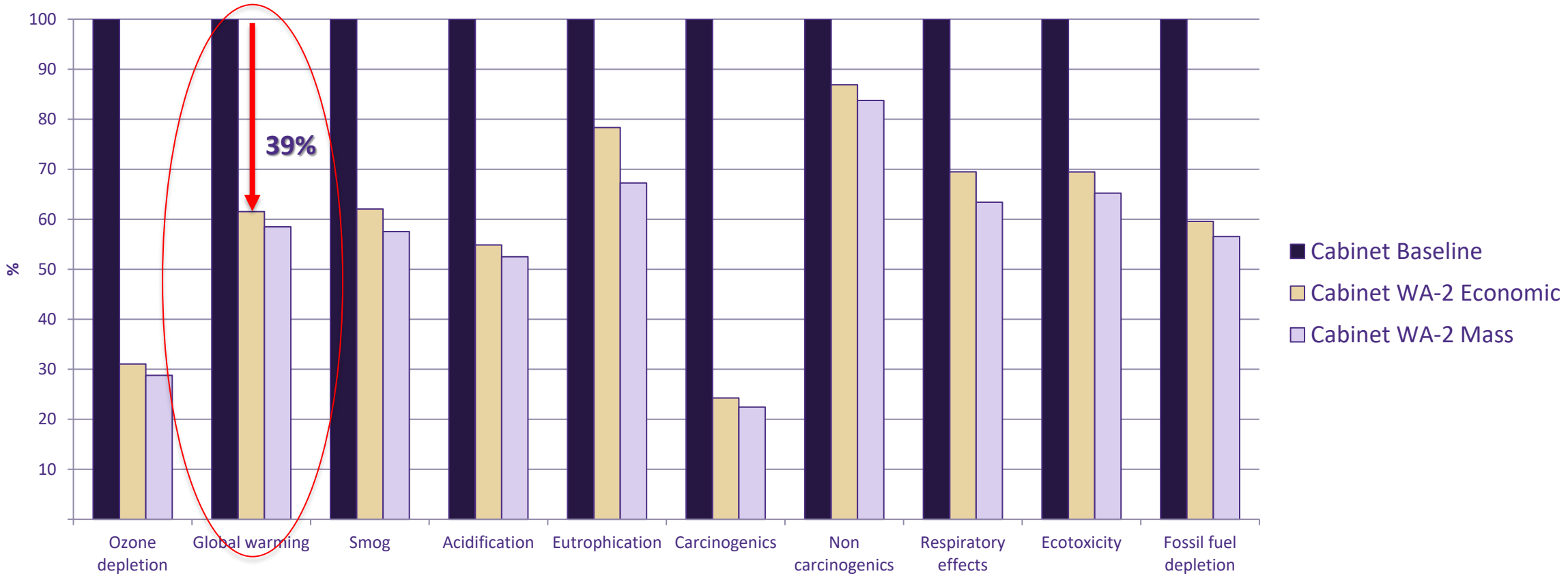


Comparative analysis results (using mass allocation for alder lumber)



Comparative analysis results (comparing economic and mass allocation)

40%



Key findings

- **Alder kitchen cabinet doors have a smaller environmental footprint across all the impact categories, as compared to an alternate kitchen cabinet door.**
- **The contribution of alder to the global warming potential of the kitchen cabinet door is only 3% on average.**
  - **The contribution of lumber to the environmental impact of the kitchen cabinet door varies from 2.2% to 7.1% on average.**
  - **So we can state the lower environmental footprint of alder boards primarily contributes to the lower environmental impact of alder cabinets.**
- **The electricity consumption is the main contribution to the global warming potential of the kitchen cabinet door.**
  - **Hence, the global warming of the kitchen cabinet door can be greatly reduced by increasing the proportion of renewable energy used.**

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Plot and landscape level assessment of Alder as a Natural Climate Solution (NCS)

THIS STUDY WAS UNDERTAKEN IN COLLABORATION WITH OSU:
ALL THE ALDER AND CONIFER GROWTH MODELS WERE DEVELOPED BY OSU RESEARCHERS

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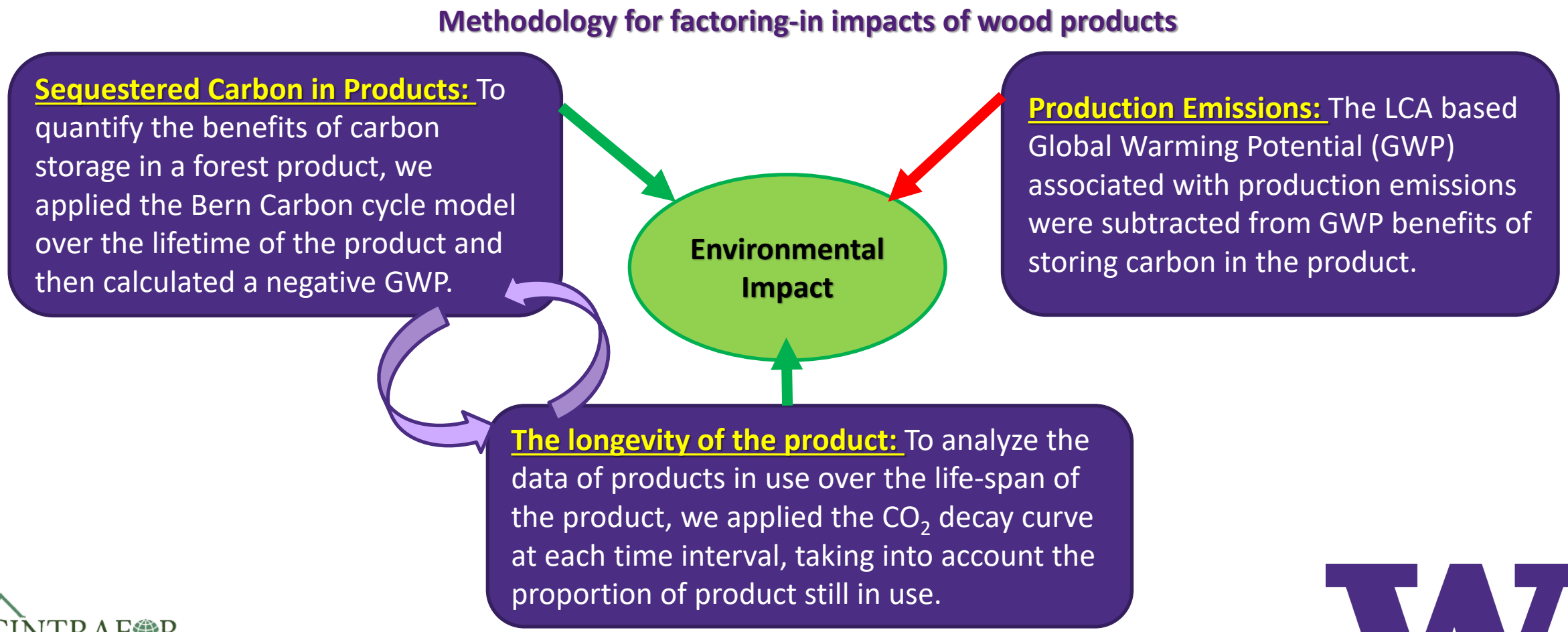
Environmental assessment of working forests



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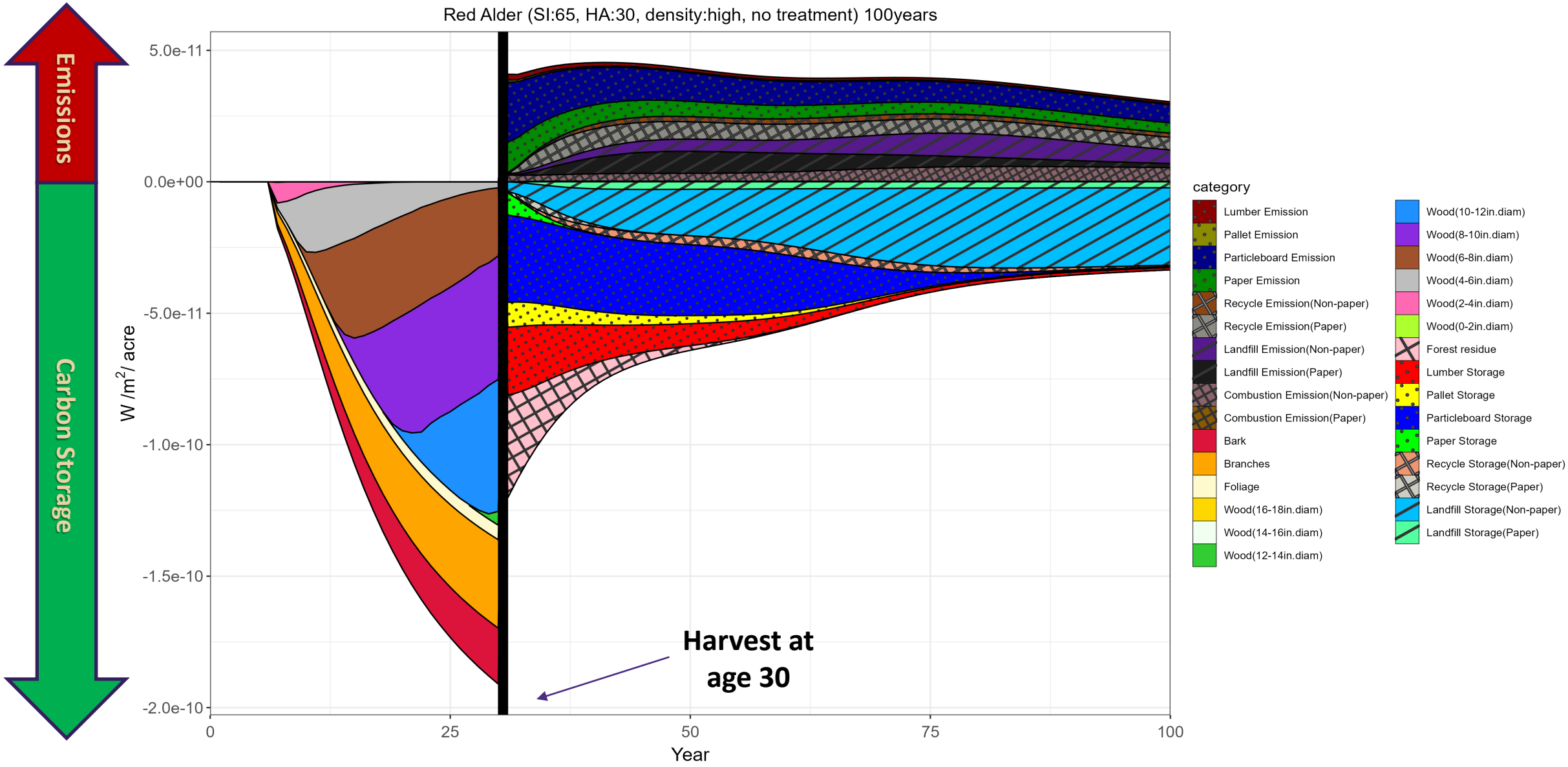
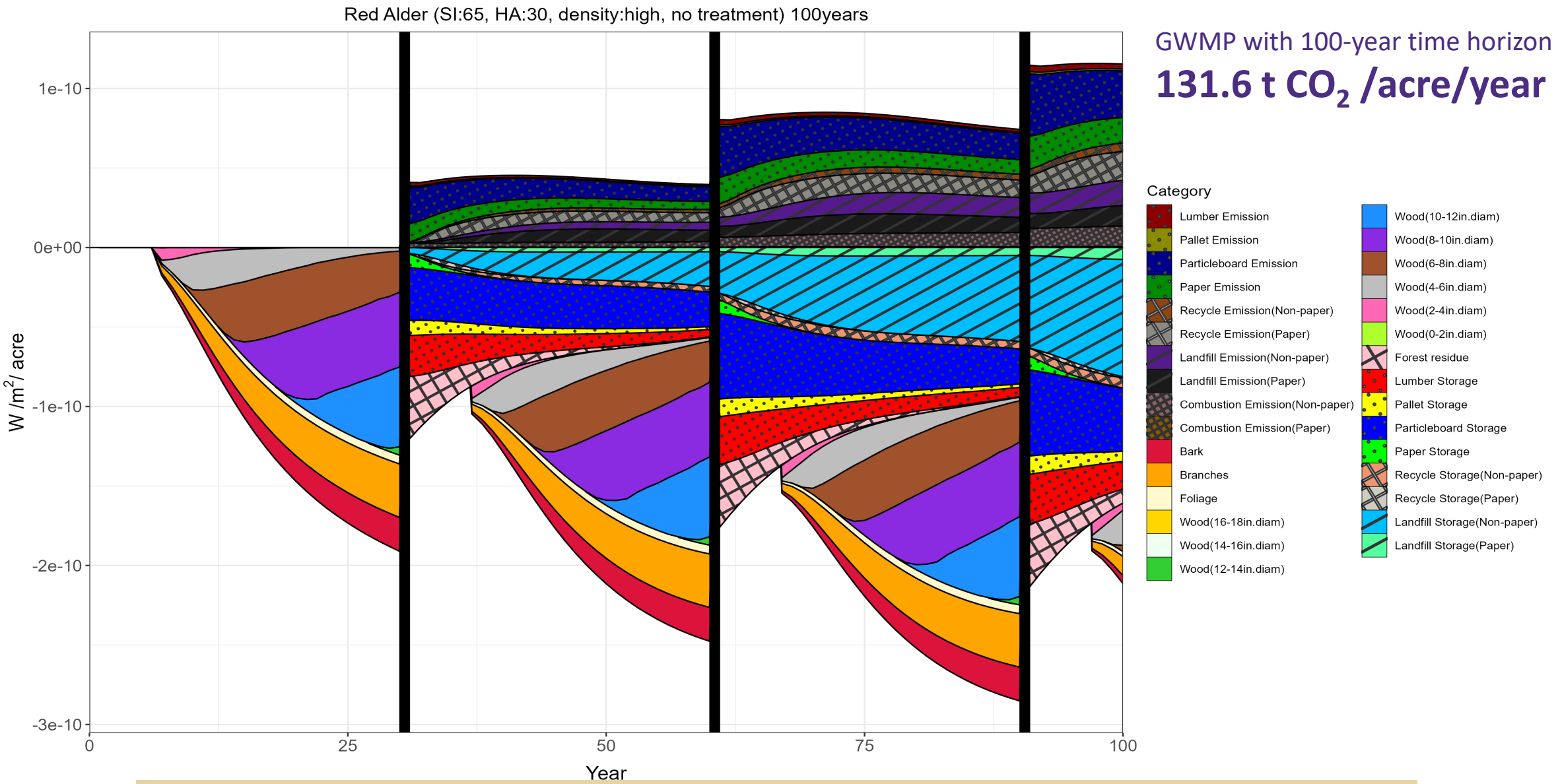
Plot Level Temporal Global Warming Potential Modeling (Single Cycle)



Red Alder (Site Index: 65, Harvesting age: 30, high density, no treatment)

Plot Level Temporal Global Warming Potential Modeling (Multiple Cycles)

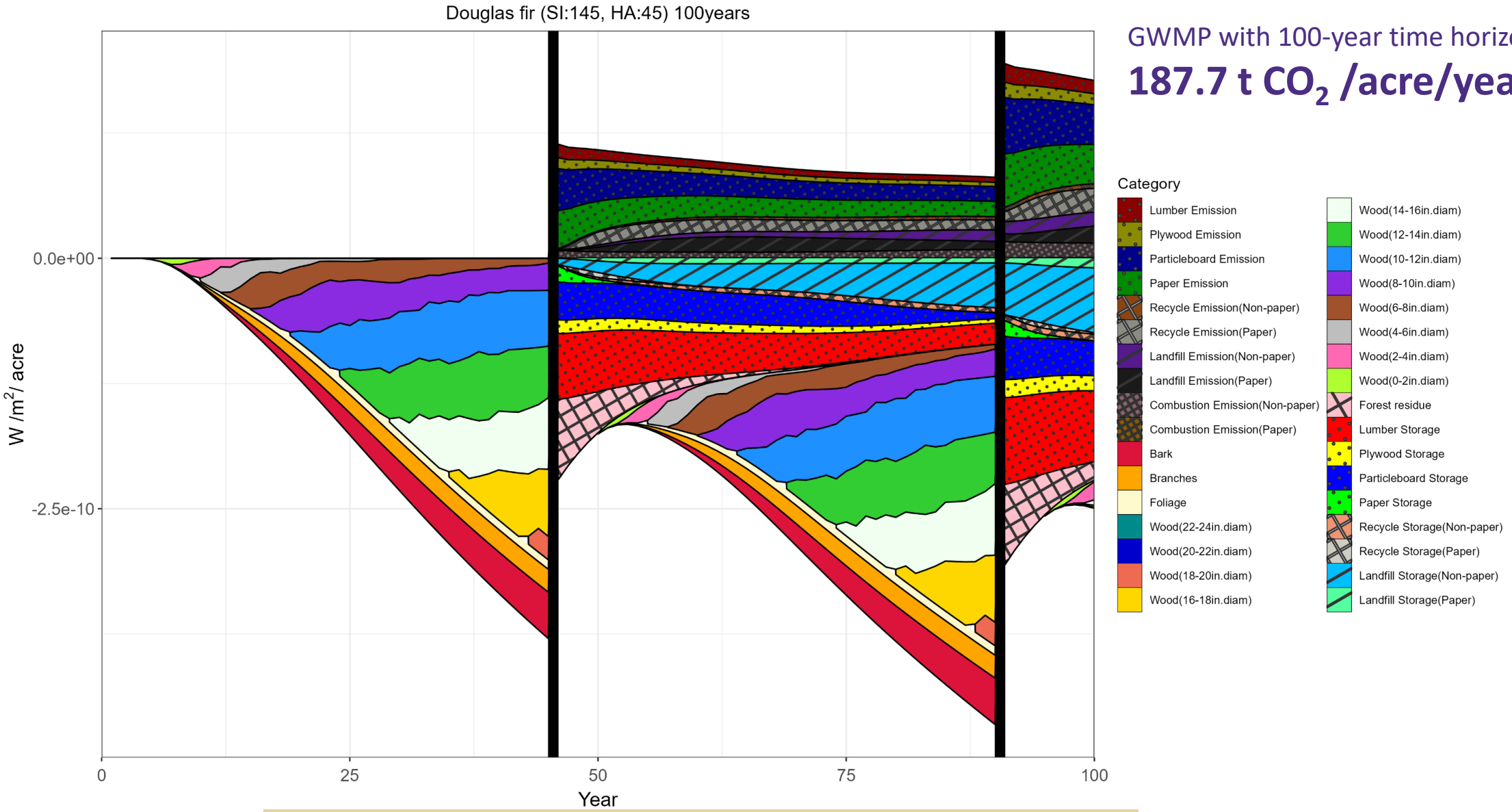


GWMP with 100-year time horizon :

131.6 t CO_2 /acre/year

Red Alder (Site Index: 65, Harvesting age: 30, high density, no treatment)

Plot Level Temporal Global Warming Potential Modeling (Multiple Cycles)



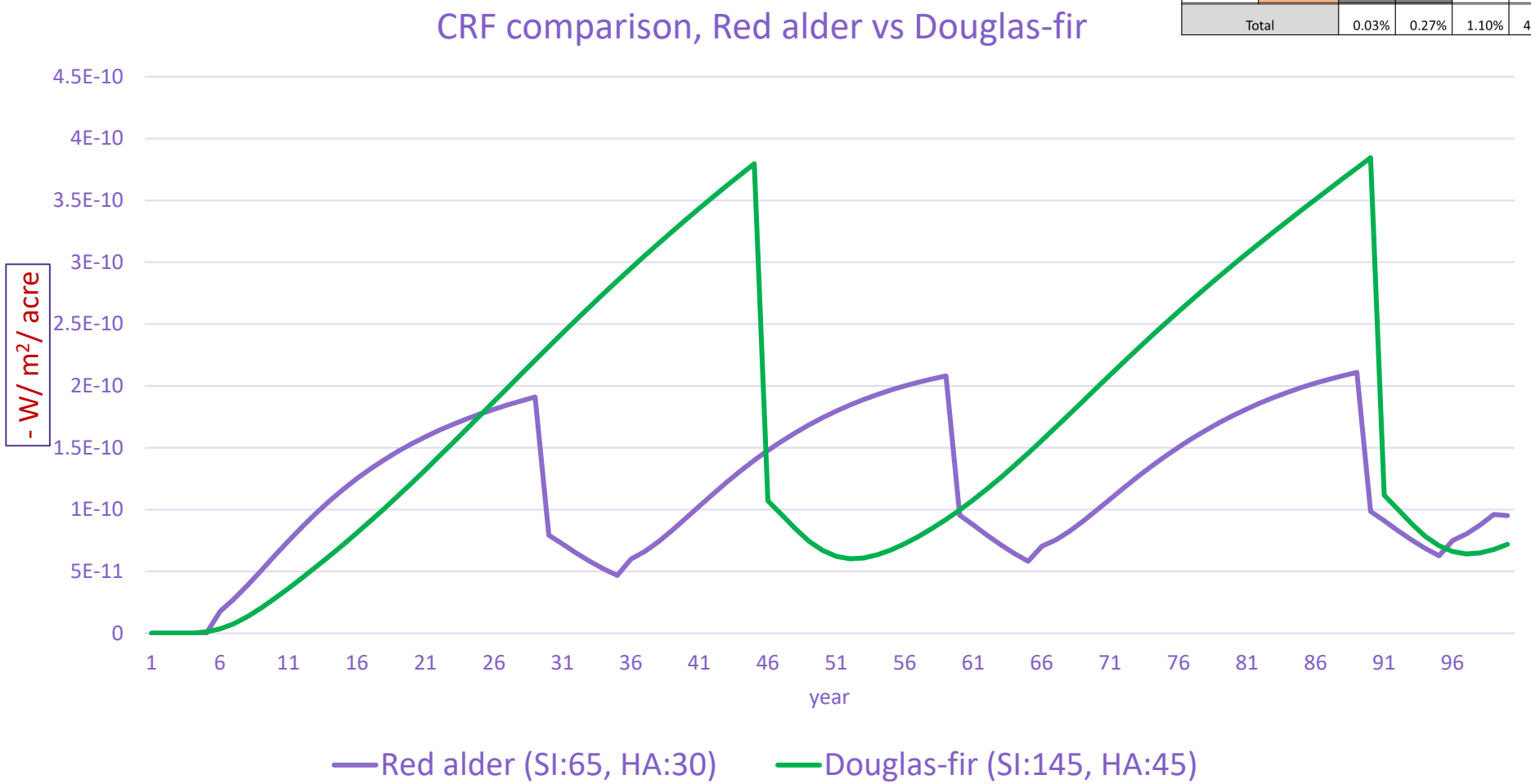
GWMP with 100-year time horizon :

187.7 t CO_2 /acre/year

Douglas-fir (Site Index: 145, Harvesting age: 45)

Faster vs Slower Growing Species(RA vs DF)

Species		Douglas-fir									
	Site Index	85	95	105	115	125	135	145	155	165	Total
Red alder	35	0.00%	0.01%	0.12%	0.28%	0.16%	0.01%	0.00%	0.00%	0.00%	0.58%
	45	0.01%	0.01%	0.06%	0.34%	0.92%	0.88%	0.13%	0.00%	0.00%	2.37%
	55	0.02%	0.11%	0.24%	0.97%	2.25%	6.39%	3.41%	0.26%	0.00%	13.65%
	65	0.01%	0.10%	0.37%	1.58%	3.96%	12.10%	14.32%	2.67%	0.01%	35.13%
	75	0.00%	0.03%	0.22%	0.82%	2.78%	13.00%	13.78%	3.21%	0.06%	33.90%
	85	0.00%	0.00%	0.08%	0.27%	1.10%	4.97%	5.40%	1.14%	0.05%	13.02%
	95	0.00%	0.00%	0.01%	0.11%	0.49%	0.34%	0.30%	0.10%	0.02%	1.36%
Total		0.03%	0.27%	1.10%	4.37%	11.66%	37.69%	37.35%	7.39%	0.14%	100%



For this set of forestland in WA State DF is a better NCS than Red Alder

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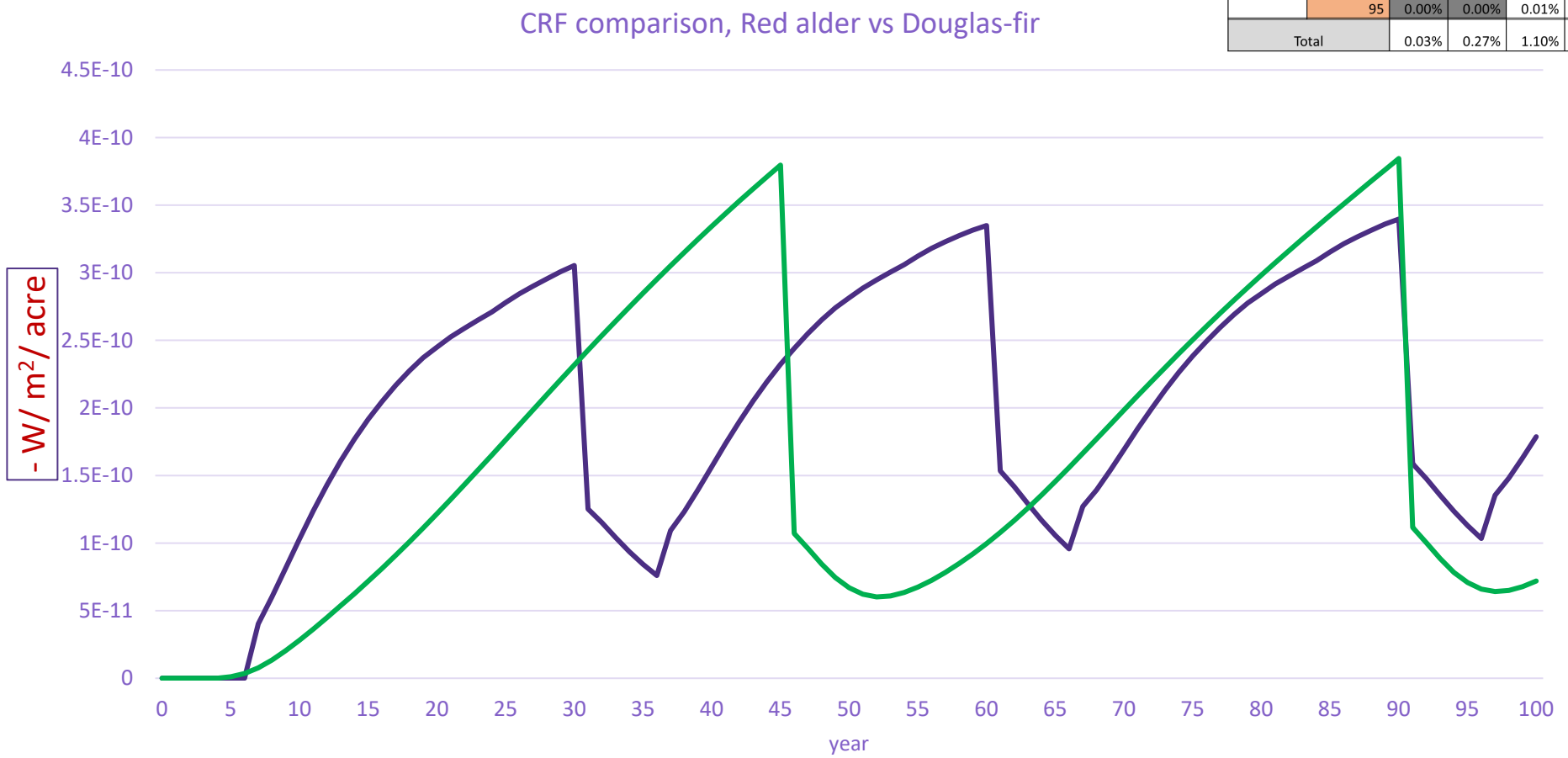

For this set of forestland in WA State Alder is a better NCS than DF

Natural Climate Solution?
Yes!

Additionally?
Yes!

Potential Carbon Credit?
Yes!

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In Summary

- Alder could play an important further improving this NCS role of working forests
- We know that working forests are established to be a natural climate solution in WA state
  - It may be noted that the working forests in WA, dominated by Douglas-Fir and other conifers plantations, play an important GHG mitigating role in the PNW
- With proper planning this NCS role of working forests may be further improved by introduction of more alder plantations in the landscape
  - A carbon-credit case may be made for introduction of red alder in at least 10% (optimistic 30%) of working forest lands in WA

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Thank you for your attention!

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