Environmental Product Declaration

Western Red Cedar Lumber

This Type III environmental declaration is developed according to UL PCR Part A and Part B, ISO 21930 and 14025 for industry average cedar lumber manufactured by the members of the Western Red Cedar Lumber Association. This environmental product declaration (EPD) reports environmental impacts based on established life cycle impact assessment (LCIA) methods. The reported environmental impacts are estimates, and their level of accuracy may differ for a particular product line and reported impact. LCAs do not generally address site-specific environmental issues of related to resource extraction or toxic effects of products on human health of product systems. Unreported environmental impacts include (but are not limited to) factors attributable to human health, land use change and habitat destruction. Forest certification systems and government regulations address some of these issues. The products in this EPD conform to: regulations of BC and forest certification schemes (Canadian Standard Association, Sustainable Forestry initiative (SFI), and Forest Stewardship Council (FSC)). EPDs do not report product environmental performance against any benchmark.

Issued July 2025
Valid until July 2030

WESTERN RED CEDAR LUMBER ASSOCIATION
REALCEDAR
WRCLA

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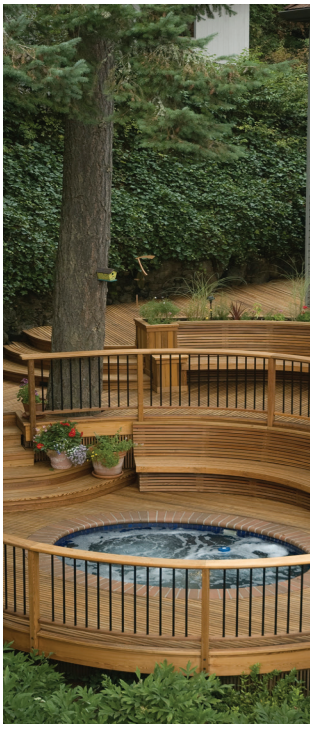
Manufacturer Information

This EPD addresses products from multiple manufacturers and represents an average for the membership of the Western Red Cedar Lumber Association (WRCLA), a non-profit trade association representing manufacturers of western red cedar products. This average is based on a sample that included two lumber mills in British Columbia (BC). The total data represents 13% of western red cedar lumber production primary data gathered in the year 2022. These data are combined with recent in-house coastal harvesting data, a survey of cedar nursery production in BC, and CORRIM (The Consortium for Research on Renewable Industrial Materials) forest management data.



Product Description

Western Red Cedar rough lumber is remanufactured into various dimensions, profiles and grades of Western Red Cedar finished products.

Product composition of one thousand board feet of (mfbm) of green lumber at the mill gate:

- Wood fibre: 592.2 kg on oven dry basis

Scope: Cradle-to-gate

EPD Type: Industry average

Declared unit: One thousand board feet (1 mfbm) of rough green lumber at mill gate

System boundary: Life cycle activities from resource extraction (A1), transportation (A2), and processing through product (lumber) manufacturing (A3).

Geographic boundary: North America.

Figure 1. Life cycle stages and information modules included in the system boundary

Production			Construction		Use							End-of-life				Benefits/Loads beyond system boundary
A1	*A2*	*A3*	*A4*	*A5*	*B1*	*B2*	*B3*	*B4*	*B5*	*B6*	*B7*	*C1*	*C2*	*C3*	*C4*	*D*
Resource extraction	Transportation to facility	Manufacturing	Transportation to manufacturing	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operation energy use	Water consumption	Demolition	Transportation	Sorting/separation	Disposal	Reuse/recovery/recycling
√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X

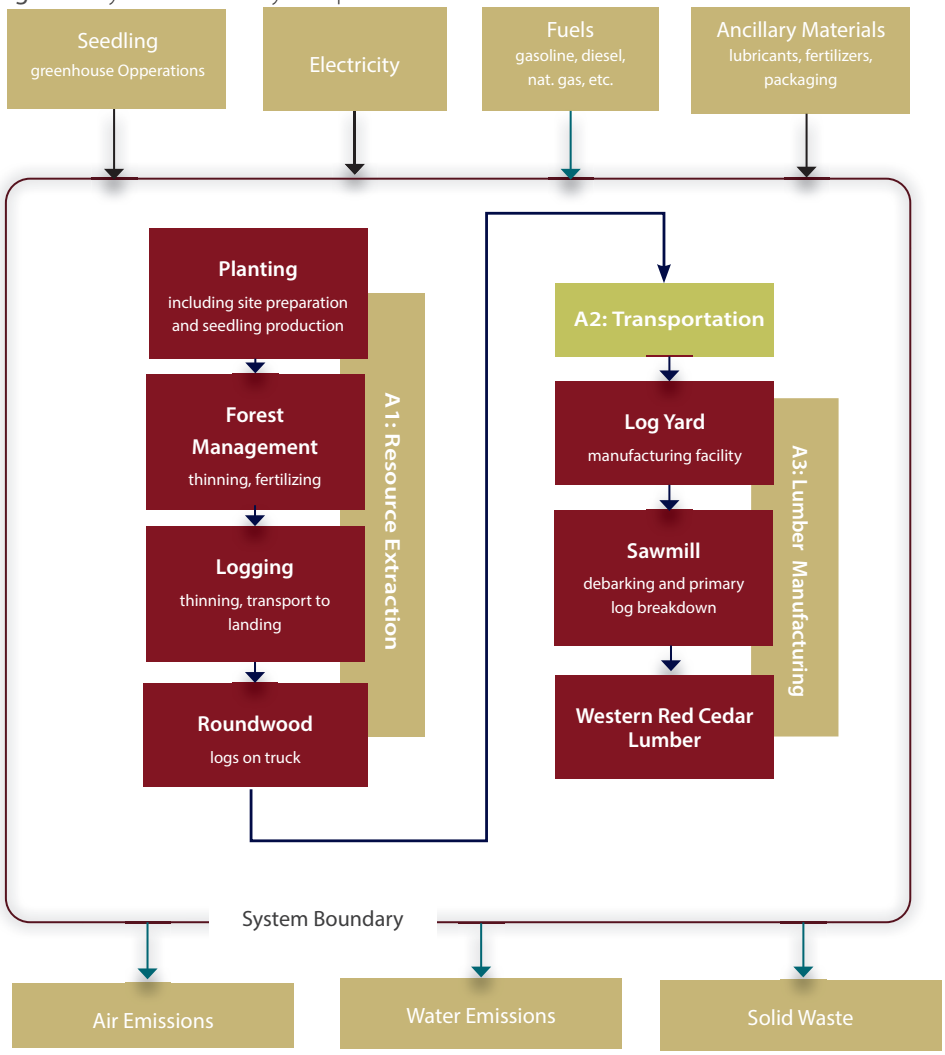
Life Cycle Assessment

Life cycle assessment (LCA) is a rigorous study of inputs and outputs over the entire life of a product or process and the associated environmental impact of those flows to and from nature. The underlying LCA supporting this EPD was performed by FPInnovations in 2024 and was third-party peer-reviewed by a panel consist of Thomas P Gloria at Industrial Ecology Consultants (Chair), James Salazar at WAP Sustainability Consulting, and Charles Thibodeau at CT Consultant. The LCA study collected primary data from western cedar lumber operations in 2023 for the production year 2022. SimaPro software v8.3.0.0 was the modeling software used to generate life cycle impact assessment results.

The system boundary includes all the production steps from extraction of raw materials from the earth (the cradle) through to final product at the mill gate. See Figure 1. The boundary includes the transportation of major inputs to, and within, each activity stage.

Ancillary materials such as hydraulic fluids, lubricants and packaging are included in the boundary. Mass or energy flows are excluded if they account for less than 1% of model flows and less than 2% of life cycle impacts in all categories. Human activity, capital equipment and land use are excluded.

Figure 2. System boundary and process flows



Environmental Performance

Environmental impacts were calculated using IPCC GWP100 (2021), TRACI (Tool for the Reduction and Assessment of Chemical and other Environmental Impacts) version 2.1 (the life cycle impact assessment methodology developed by the U.S. Environmental Protection Agency), and CML-baseline v4.7. Impact indicator results are presented in Table 1, and 2. Impact indicators used are global warming potential (GWP), acidification potential, eutrophication potential, smog potential, ozone depletion potential, and abioptic resource depletion potential (fossil) . Life cycle inventory (LCI) indicators are shown in Table 3 and 4. The LCA model is designed to track all carbon fluxes in the GWP measure: the carbon stored in lumber and all carbon emissions, including those from biomass combustion throughout the cradle-to-gate life cycle. A summary of the carbon balance at each life cycle stage is depicted in Table 6.

Lumber manufacturing generates multiple products that provide revenue: the main product (lumber) and co-products (bark, sawdust and pulp chips). Allocation of environmental burdens to cedar lumber and its co-products is done according to masss allocation principles.

Table 1: Environmental performance of WRC rough green lumber on one thousand board feet basis, by life cycle stage

Impact category	Unit	Total	A1	A2	A3
GWP100 - fossil	kg CO_2-eq	208.99	173.50	26.93	8.56
GWP100 - biogenic	kg CO_2-eq	1.69	0.09	0.22	1.39
Ozone depletion	kg CFC-11 eq	1.13E-05	9.91E-06	9.24E-08	1.25E-06
Acidification	kg SO2 eq	0.92	0.70	0.15	0.07
Eutrophication	kg N eq	0.14	0.12	0.01	4.23E-03
Smog	kg O3 eq	26.66	20.32	4.31	2.04
Abiotic depletion (fossil fuels)	MJ, LHV	2,881.00	2,405.18	336.42	139.39

Table 2: Environmental performance of WRC rough green lumber on one cubic meter basis, by life cycle stage

Impact category	Unit	Total	A1	A2	A3
GWP100 - fossil	kg CO_2-eq	116.11	96.39	14.96	4.76
GWP100 - biogenic	kg CO_2-eq	0.94	0.05	0.12	0.77
Ozone depletion	kg CFC-11 eq	6.28E-06	5.51E-06	5.13E-08	6.94E-07
Acidification	kg SO2 eq	0.51	0.39	0.08	0.04
Eutrophication	kg N eq	0.08	0.07	0.01	2.35E-03
Smog	kg O3 eq	14.81	11.29	2.39	1.13
Abiotic depletion (fossil fuels)	MJ, LHV	1600.56	1336.21	186.90	77.44

Table 3: Life cycle inventory (LCI) parameters for WRC rough green lumber on one thousand board feet basis, by life cycle stage

Parameter	Unit	Amount			
		Total	A1	A2	A3
Use of primary resources					
Renewable primary energy career used as energy (RPR_E)	MJ, LHV	165.29	2.39	0.72	162.18
Renewable primary energy career used as material (RPR_M)	MJ, LHV	13,327.99	-	-	13,327.99
Non-renewable primary energy career used as energy ($NRPR_E$)	MJ, LHV	2897.79	2415.14	341.28	141.36
Non-renewable primary energy career used as material ($NRPR_M$)	MJ, LHV	-	-	-	-
Secondary material, secondary fuel, and recovered energy					
Secondary material (SM)	kg	-	-	-	-
Renewable secondary fuel (RSF)	MJ, LHV	40,590.65	-	-	40,590.65
Non-renewable secondary fuel (NRSF)	MJ, LHV	-	-	-	-
Recovered energy (RE)	MJ, LHV	-	-	-	-
Mandatory inventory parameters					
Fresh water consumption (FW)	m^3	-	-	-	0.26
Indicators describing waste					
Hazardous waste disposed (HWD)	kg	0.01	0.01	-	4.08E-05
Non-hazardous waste disposed (NHWD)	kg	0.43	0.10	0.31	0.02
High level radioactive waste (HLRW)	kg	4.48E-05	2.74E-05	1.42E-05	3.16E-06
Intermediate and low-level radioactive waste (ILLRW)	kg	1.02E-04	6.21E-05	3.17E-05	8.33E-06
Components for reuse (CRU)	kg	-	-	-	-
Materials for recycling (MR)	kg	-	-	-	-
Materials for energy recovery (MER)	kg	-	-	-	-
Recovered energy exported from the product system (EE)	MJ, LHV	-	-	-	-
Additional inventory parameters					
Biogenic carbon removal from the product (BCRP)	kg CO_2	-1119.14	-1119.14	-	-
Biogenic carbon emissions from the product (BCEP)	kg CO_2	0.30	0.03	0.21	0.06
Biogenic carbon removal from packaging (BCRK)	kg CO_2	-	-	-	-
Biogenic carbon emissions from packaging (BCEK)	kg CO_2	-	-	-	-
Biogenic carbon emissions from combustion of waste from renewable sources used in production (BCEW)	kg CO_2	-	-	-	

Table 5: Life cycle inventory (LCI) parameters for WRC rough green lumber on one cubic meter basis, by life cycle stage

Parameter	Unit	Amount			
		Total	A1	A2	A3
Use of primary resources					
RPR_E	MJ, LHV	91.83	1.33	0.40	90.10
RPR_M	MJ, LHV	7,404.44	-	-	7,404.44
$NRPR_E$	MJ, LHV	1,609.88	1,341.74	189.60	78.53
$NRPR_M$	MJ, LHV	-	-	-	-
Secondary material, secondary fuel, and recovered energy					
SM	kg	-	-	-	-
RSF	MJ, LHV	22,550.36	-	-	22,550.36
NRSF	MJ, LHV	-	-	-	-
RE	MJ, LHV	-	-	-	-
Mandatory inventory parameters					
FW	m^3	-	-	-	0.14
Indicators describing waste					
HWD	kg	5.56E-03	5.56E-03	-	2.27E-05
NHWD	kg	0.24	0.06	0.17	0.01
HLRW	kg	2.49E-05	1.52E-05	7.89E-06	1.76E-06
ILLRW	kg	5.67E-05	3.45E-05	1.76E-05	4.63E-06
CRU	kg	-	-	-	-
MR	kg	-	-	-	-
MER	kg	-	-	-	-
EE	MJ, LHV	-	-	-	-
Additional inventory parameters					
BCRP	kg CO_2	-621.74	-621.74	-	-
BCEP	kg CO_2	0.17	0.02	0.12	0.03
BCRK	kg CO_2	-	-	-	-
BCEK	kg CO_2	-	-	-	-
BCEW	kg CO_2	-	-	-	-

Glossary

Primary Energy Consumption

Primary energy is the total energy consumed by a process including upstream losses during energy production and delivery. Energy is reported in megajoules (MJ).

Global Warming Potential

This impact category refers to the potential change in the earth's energy balance due to the accumulation of greenhouse gases which block long wave radiation that would otherwise have passed out of the earth's atmosphere. Greenhouse gas refers to several different gases including carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). For global warming potential, greenhouse gases are tracked and their impact is reported in units of CO_2 equivalents (eq).

Acidification Potential

Acidification refers to processes that increase the acidity of water and soil systems as measured by hydrogen ion concentrations (H^+) and are often manifested as acid rain. Damage to plant and animal ecosystems can result, as well as corrosive effects on buildings, monuments and historical artifacts. Atmospheric emissions of nitrogen oxides (NO_x) and sulphur dioxide (SO_2) are two key substances contributing to acidification potential. Acidification potential is reported in kg of SO_2 equivalents.

Eutrophication Potential

Eutrophication is the fertilization of surface waters by nutrients that were previously scarce, leading to a proliferation of aquatic photosynthetic plant life which may then lead to further consequences including foul odor or taste, loss of aquatic life, or production of toxins. Eutrophication is caused by excessive emissions to water of phosphorus (P) and nitrogen (N). This impact category is reported in units of N equivalent.

Smog Potential

Photochemical smog is the chemical reaction of sunlight, nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the lower atmosphere. Ground-level ozone is an indicator, and NO_x emissions are a key driver in the creation of ground-level ozone. This impact indicator is reported in units of O_3 equivalent.

Ozone Depletion Potential

This impact category addresses the reduction of protective ozone within the upper atmosphere caused by emissions of ozone-depleting substances such as chlorofluorocarbons (CFCs). Reduction in ozone in the stratosphere leads to increased ultraviolet-B radiation reaching earth, which can have human health impacts as well as damage crops, materials and marine life. Ozone depletion potential is reported in units of CFC-11 equivalent.

Source: *Bare et al, 2003*

Freshwater Consumption

Use of freshwater when release into the original watershed does not occur because of evaporation, product integration, or discharge into different watersheds, or the sea.

LCI databases and versions

DATASMART (2021), ecoinvent 3.8, and USLCI(2015)

LCA Software

SimaPro v9.4.0.3

Table 5: Environmental impacts calculated using CML 2 baseline 2000 method and energy consumption on one cubic meter of lumber basis, by life cycle

Impact category	Unit	Total	A1	A2	A3
Abiotic depletion	kg Sb eq	1.40E-05	8.62E-06	6.79E-07	4.66E-06
Abiotic depletion (fossil fuels)	MJ	1,641.26	1,371.55	187.17	82.54
Global warming (GWP100a)	kg CO_2 eq	119.03	98.78	15.03	5.21
Ozone layer depletion (ODP)	kg CFC-11 eq	4.80E-06	4.22E-06	3.66E-08	5.41E-07
Human toxicity	kg 1,4-DB eq	37.54	24.52	11.67	1.35
Fresh water aquatic ecotoxicity.	kg 1,4-DB eq	7.07	2.16	4.51	0.40
Marine aquatic ecotoxicity	kg 1,4-DB eq	49,677.06	32,323.23	15,951.65	1,402.18
Terrestrial ecotoxicity	kg 1,4-DB eq	0.07	0.03	0.01	0.03
Photochemical oxidation	kg C_2H_4 eq	0.02	0.01	2.91E-03	1.24E-03
Acidification	kg SO_2 eq	0.42	0.32	0.07	0.03
Eutrophication	kg PO_4--- eq	0.11	0.08	0.01	0.01

References

Bare, J. C., Norris, G. A, Pennington, D. W., and McKone, T. 2003. TRACI: The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts. Journal of Industrial Ecology, Vol.6 No.3-4.

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Interpretation

Sustainable Forestry

Western red cedar lumber from WRCLA members come from forests that are independently certified as legal and sustainable.

Carbon Balance

The carbon that is part of the molecular composition of wood is derived from carbon dioxide removed from the atmosphere by the growing tree that produced the wood; this carbon is often a consideration in greenhouse gas calculations and carbon footprints for wood products. See Table 4 for cradle-to-gate carbon balance at each of the life cycle stage, i.e., the net carbon footprint per 1Mfbm of lumber, calculated considering the carbon contained in the wood (a negative number as carbon sequestering is a removal of atmospheric carbon dioxide) and the life cycle carbon emissions and removals from bioenergy (net zero), and carbon emissions from fossil fuel combustion (a positive number). Carbon dioxide sequestered in lumber is used as the starting point, and after accounting for carbon emissions at each of the stage, the final product, lumber leaving the mill gate still caries negative carbon balance, meaning that lumber has sequestered more carbon than cradle-to-gate carbon dioxide emissions. In other words, stored carbon in cedar lumber at the manufacturing gate is still available to mitigate carbon footprint of buildings.

Table 6: Carbon balance

	per 1Mfbm	per 1 m^3
Forest carbon uptake	-2824.34	-1569.07
GWP harvesting from forests	173.50	98.39
Net carbon balance cradle-to-round wood at forest	-2650.84	-1470.68
GWP transporting from forest to sawmill	26.93	14.66
Net carbon balance cradle-to-round wood at sawmill	-2623.91	-1456.02
GWP lumber manufacture	8.56	4.76
Net carbon balance cradle-to-green lumber	-2615.35	-1451.26

**GWP: Global warming potential*

About this EPD

Declaration no: 20250228-WRC-01
PCR: UL Environment: Product Category Rules for Building-Related Products and Services, Part A: Life Cycle Assessment Calculation Rules and Report Requirements, v4.0
Part B: Structural and Architectural Wood Products EPD Requirements UL 10010-9 v.1.1

- EPDs from different programs may not be comparable.

- Comparison of the environmental performance of construction products using EPD information shall be based on the product's use and impacts at the construction works level. EPDs may not be used for comparability purposes when not considering the construction works energy use phase. EPDs are comparable only when all stages of a life cycle have been considered, when use equivalent scenarios with respect to construction works. However, variations and deviations are possible due to use of different LCA software and background LCI datasets.

- While this EPD does not address landscape level forest management impacts, potential impacts may be addressed through requirements put forth in regional regulatory frameworks, ASTM 7612-15 guidance, and ISO 21930 Section 7.2.11 including notes therein. These documents, combined with this EPD, may provide a more complete picture of environmental and social performance of wood products.

- While this EPD does not address all forest management activities that influence forest carbon, wildlife habitat, endangered species, and soil and water quality, these potential impacts may be addressed through other mechanisms such as regulatory frameworks and/or forest certification systems which, combined with this EPD, will give a more complete picture of environmental and social performance of wood products.

- EPDs can complement but cannot replace tools and certifications that are designed to address environmental impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, etc. National or regional life cycle averaged data for raw material extraction does not distinguish between extraction practices at specific sites and can greatly affect the resulting impacts.

- Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact when averaging data. Variability was estimated in this EPD by calculating the weighted average lumber production of the survey participants.

PCR Review was conducted by:

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Markets of applicability:

North America and Netherlands

Explanatory materials on the background LCA can be obtained from Western Red Cedar Lumber Association

Independent verification of the declaration and data, according to ISO 21930:2017 and ISO 14025:2006

☐ internal ☒ external

Third Party Verifier:

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Data for the underlying LCA was provided by Downie Timber Ltd., Gilbert Smith Forest Products, Interfor Corporation, and Western Forest Products Inc,

Issued July 2025
Valid until July 2030