

Online Supplemental

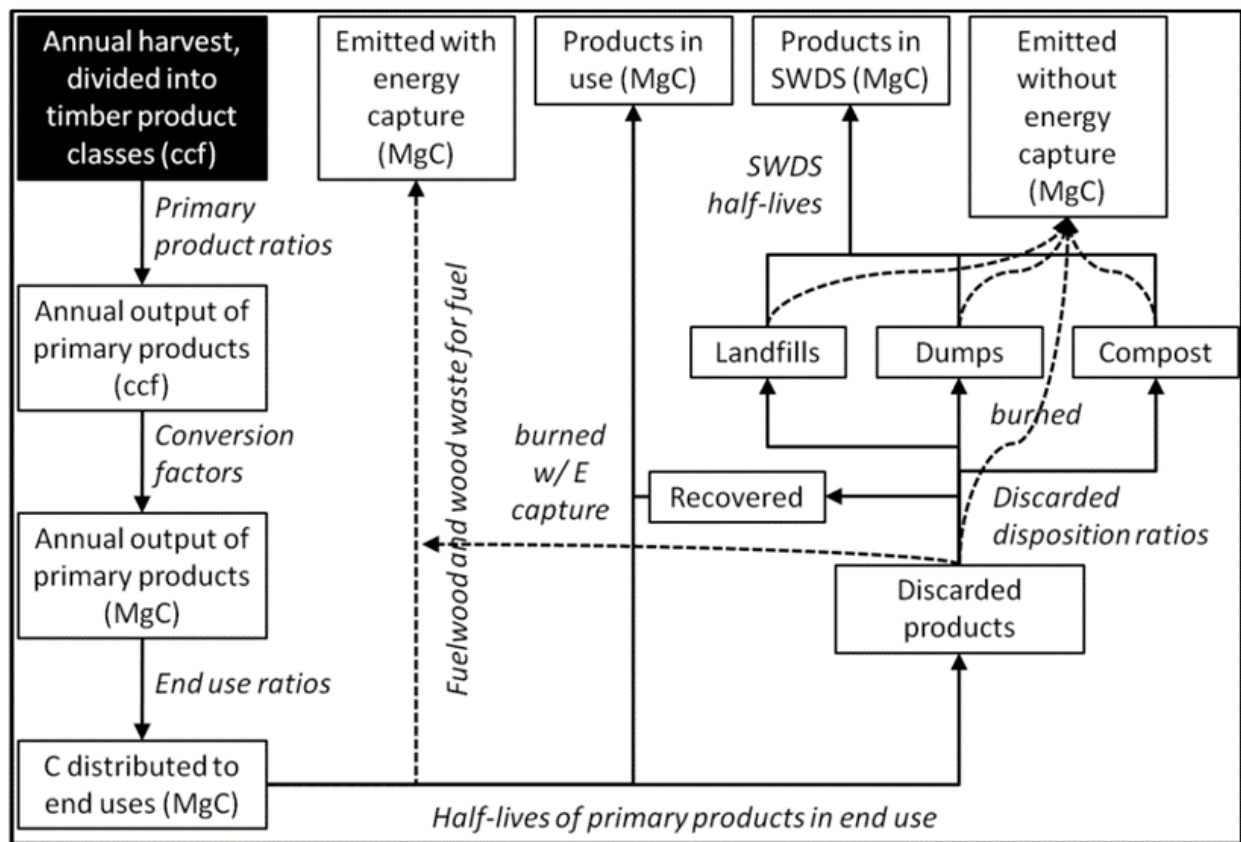


Figure S1. Approach to quantifying harvested wood product pools (HWP) storage and emissions (from [1]).

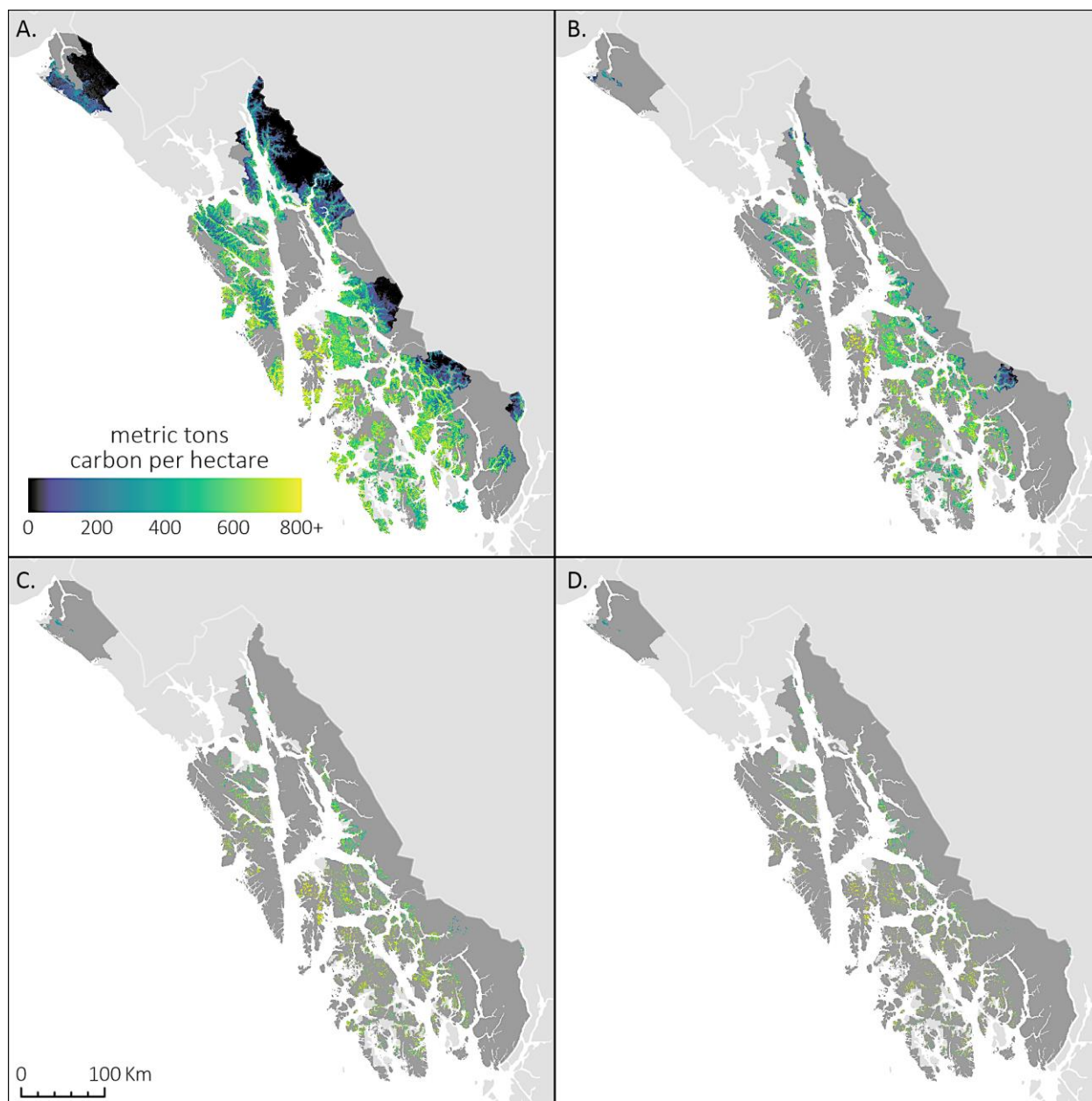


Figure S2. Spatial distribution of total carbon (metric tons ha^{-1}) in woody plant biomass and soil in at-risk scenarios for IRAs (inventoried roadless areas): (A) all IRAs, (B) Scenario 1, (C) Scenario 2, and (D) Scenario 3. Study area shown in gray.

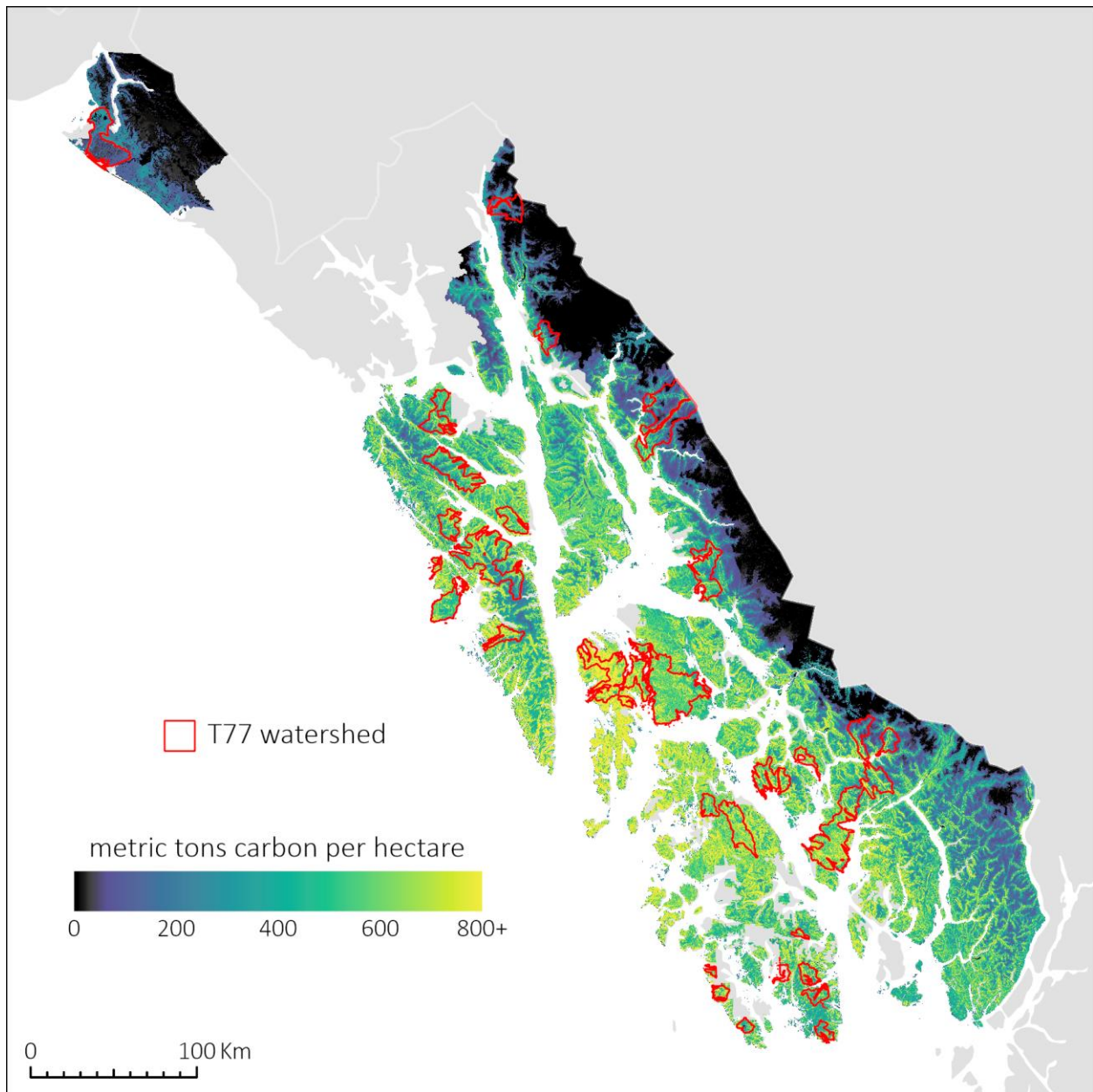


Figure S3. Spatial distribution of T77 watersheds and total carbon (metric tons ha^{-1}) in woody plant biomass and soil pools combined.

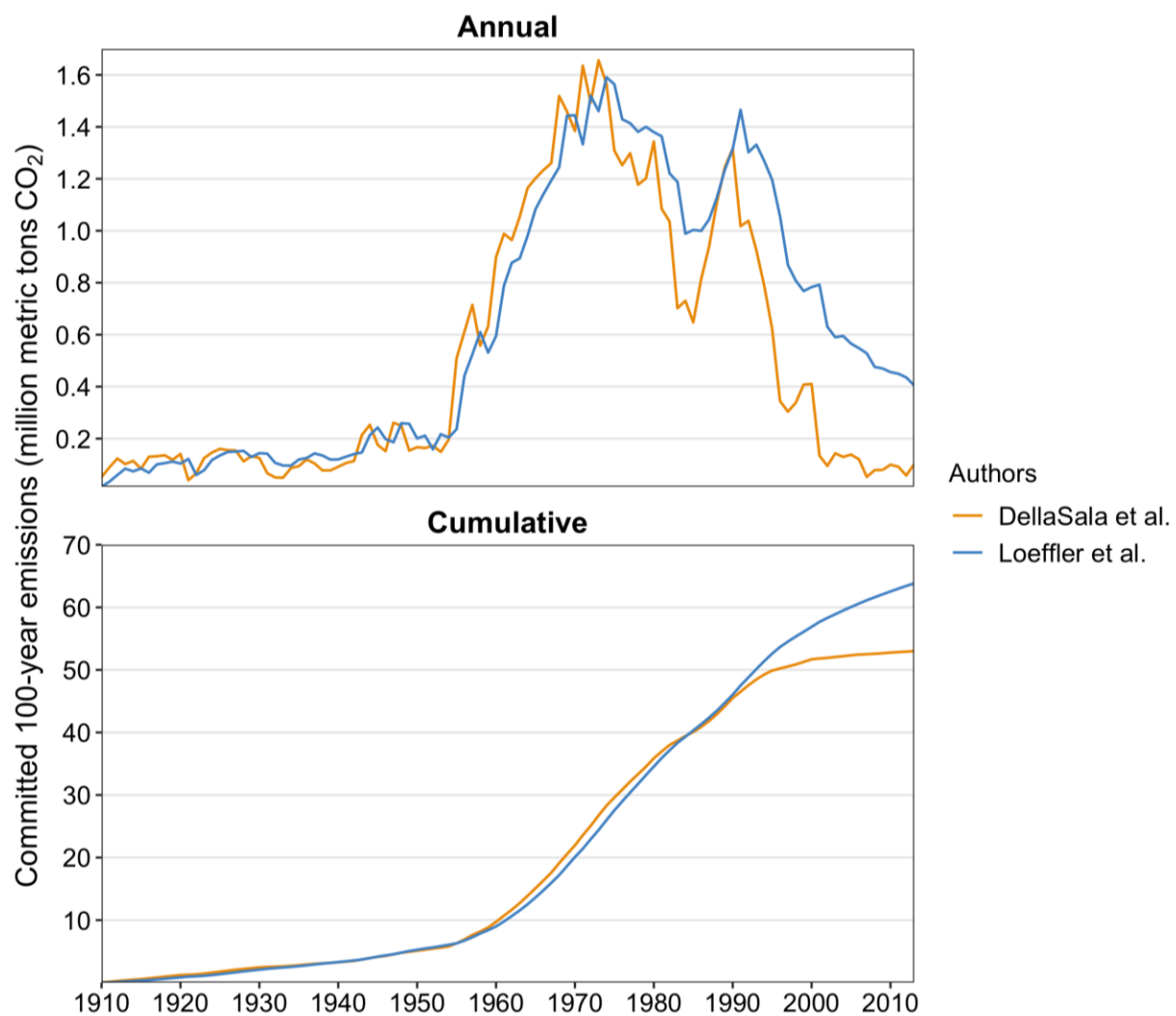


Figure S4. Committed 100-year emissions from both the Tongass and Chugach National Forest timber harvests (1910-2013). Comparison of our study with prior research [2]. Graphical results are based on data from both the Tongass and Chugach for consistency with prior research [2].

Table S1. Carbon datasets used in this study.

Carbon Pool	Description	Spatial Resolution	Citation
Biomass	Potential C density estimates in woody biomass pools including live trees, roots, woody debris, seedlings/saplings, snags, and understory vegetation. Includes lower and upper bounds.	30 m	[3]
Biomass	C density estimates in aboveground live dry woody biomass.	30 m	[4]
Soil	Soil organic C density estimates in top 1 m of mineral soil plus surface organic horizons.	90.5 m	[5]

Table S2. Historic (1909-2021) and projected (2022-2100) harvest levels (thousand cubic meters per year, $1 \times 10^3 \text{ m}^3 \text{ yr}^{-1}$), committed 100-year emissions (thousand metric tons carbon dioxide equivalents per year, $1 \times 10^3 \text{ tCO}_2 \text{ yr}^{-1}$), annual realized emissions ($1 \times 10^3 \text{ tCO}_2 \text{ yr}^{-1}$), and cumulative realized emissions ($1 \times 10^3 \text{ tCO}_2 \text{ yr}^{-1}$) on the Tongass National Forest. All emissions estimates are based on a 100-year HWP disposition period.

Inventory Year	Harvest ($1 \times 10^3 \text{ m}^3 \text{ yr}^{-1}$)	Committed 100-year Emissions ($1 \times 10^3 \text{ tCO}_2 \text{ yr}^{-1}$)	Annual Realized Emissions ($1 \times 10^3 \text{ tCO}_2 \text{ yr}^{-1}$)	Cumulative Realized Emissions ($1 \times 10^3 \text{ tCO}_2 \text{ yr}^{-1}$)
<i>Early Historical</i>				
1909	37	17	9	9
1910	75	35	18	27
1911	183	84	44	71
1912	257	118	63	133
1913	200	92	52	185
1914	241	111	63	249
1915	174	80	50	298
1916	257	118	70	369
1917	249	114	70	439
1918	262	120	75	514
1919	227	104	69	583
1920	277	127	82	665
1921	71	33	36	700
1922	125	58	48	748
1923	246	113	76	825
1924	295	136	89	914
1925	326	150	98	1,012
1926	310	142	97	1,109
1927	316	145	100	1,208
1928	205	94	76	1,284
1929	255	117	88	1,372
1930	234	107	84	1,456
1931	111	51	56	1,512
1932	89	41	50	1,562
1933	89	41	50	1,612
1934	171	79	68	1,680
1935	185	85	72	1,752
1936	243	112	86	1,838
1937	214	99	80	1,918
1938	155	71	67	1,985
1939	161	74	68	2,054

Inventory Year	Harvest (1x10³ m³ yr⁻¹)	Committed 100-year Emissions (1x10³ tCO₂ yr⁻¹)	Annual Realized Emissions (1x10³ tCO₂ yr⁻¹)	Cumulative Realized Emissions (1x10³ tCO₂ yr⁻¹)
1940	187	86	75	2,128
1941	217	100	82	2,210
1942	234	108	87	2,297
1943	447	205	137	2,434
1944	527	242	159	2,593
1945	354	163	122	2,715
1946	295	136	110	2,825
1947	506	233	160	2,985
1948	492	226	160	3,145
1949	299	137	117	3,262
1950	331	152	125	3,388
1951	321	148	124	3,512
<i>Pulp</i>				
1952	352	162	132	3,644
1953	301	138	121	3,765
1954	406	186	146	3,912
1955	1,089	500	307	4,219
1956	1,310	602	368	4,587
1957	1,540	708	431	5,018
1958	1,189	546	361	5,379
1959	1,325	609	401	5,780
1960	1,912	879	546	6,326
1961	2,110	970	607	6,932
1962	2,060	947	610	7,542
1963	2,253	1,036	669	8,212
1964	2,524	1,160	747	8,959
1965	2,578	1,185	777	9,735
1966	2,669	1,227	815	10,550
1967	2,735	1,257	847	11,397
1968	3,287	1,511	992	12,389
1969	3,149	1,447	981	13,370
1970	2,993	1,376	963	14,332
1971	3,547	1,630	1,108	15,440
1972	3,233	1,486	1,055	16,495
1973	3,586	1,648	1,154	17,649
1974	3,398	1,562	1,130	18,779
1975	2,807	1,290	1,008	19,787
1976	2,698	1,240	991	20,778
1977	2,771	1,273	1,017	21,795
1978	2,514	1,155	965	22,760
1979	2,563	1,178	983	23,742
1980	2,915	1,340	1,071	24,813

Inventory Year	Harvest (1x10³ m³ yr⁻¹)	Committed 100-year Emissions (1x10³ tCO₂ yr⁻¹)	Annual Realized Emissions (1x10³ tCO₂ yr⁻¹)	Cumulative Realized Emissions (1x10³ tCO₂ yr⁻¹)
1981	2,347	1,079	947	25,760
1982	2,250	1,034	928	26,689
1983	1,521	699	761	27,449
1984	1,586	729	770	28,219
1985	1,405	646	724	28,943
1986	1,765	811	803	29,746
1987	2,038	937	866	30,613
1988	2,406	1,106	954	31,567
1989	2,700	1,241	1,028	32,595
1990	2,858	1,314	1,074	33,669
1991	2,208	1,015	932	34,601
1992	2,245	1,032	942	35,543
1993	1,975	908	883	36,426
1994	1,675	770	813	37,239
1995	1,343	617	732	37,971
1996	730	335	584	38,555
1997	648	298	552	39,107
1998	727	334	560	39,667
1999	885	407	587	40,254
2000	892	410	581	40,835
<i>Post Pulp</i>				
2001	290	133	433	41,267
2002	205	94	400	41,667
2003	312	143	412	42,079
2004	282	130	395	42,474
2005	301	138	388	42,862
2006	262	120	370	43,232
2007	114	52	326	43,558
2008	170	78	328	43,886
2009	172	79	319	44,205
2010	215	99	321	44,526
2011	198	91	309	44,835
2012	126	58	285	45,121
2013	221	101	299	45,419
2014	238	109	296	45,715
2015	345	159	315	46,030
<i>Transition</i>				
2016	276	127	294	46,325
2017	122	56	253	46,577
2018	120	55	246	46,823
2019	71	33	227	47,050
2020	92	42	226	47,276

Inventory Year	Harvest (1x10³ m³ yr⁻¹)	Committed 100-year Emissions (1x10³ tCO₂ yr⁻¹)	Annual Realized Emissions (1x10³ tCO₂ yr⁻¹)	Cumulative Realized Emissions (1x10³ tCO₂ yr⁻¹)
2021	108	50	224	47,500
<i>Projections</i>				
2022	279	128	258	47,757
2023	279	128	254	48,012
2024	279	128	250	48,262
2025	279	128	247	48,509
2026	279	128	244	48,753
2027	279	128	240	48,993
2028	279	128	236	49,230
2029	279	128	234	49,464
2030	279	128	231	49,695
2031	279	128	228	49,924
2032	595	273	299	50,223
2033	595	273	301	50,524
2034	595	273	301	50,824
2035	595	273	300	51,124
2036	595	273	301	51,425
2037	595	273	301	51,725
2038	595	273	300	52,026
2039	595	273	300	52,326
2040	595	273	300	52,626
2041	595	273	300	52,926
2042	595	273	300	53,226
2043	595	273	300	53,526
2044	595	273	299	53,825
2045	595	273	298	54,123
2046	595	273	299	54,422
2047	595	273	298	54,720
2048	595	273	298	55,018
2049	595	273	297	55,315
2050	595	273	297	55,612
2051	595	273	296	55,908
2052	595	273	295	56,204
2053	595	273	296	56,499
2054	595	273	295	56,794
2055	595	273	294	57,088
2056	595	273	294	57,382
2057	595	273	292	57,675
2058	595	273	293	57,967
2059	595	273	292	58,259
2060	595	273	291	58,549
2061	595	273	290	58,839

Inventory Year	Harvest (1x10³ m³ yr⁻¹)	Committed 100-year Emissions (1x10³ tCO₂ yr⁻¹)	Annual Realized Emissions (1x10³ tCO₂ yr⁻¹)	Cumulative Realized Emissions (1x10³ tCO₂ yr⁻¹)
2062	595	273	288	59,127
2063	595	273	288	59,415
2064	595	273	286	59,701
2065	595	273	285	59,986
2066	595	273	285	60,271
2067	595	273	284	60,555
2068	595	273	283	60,838
2069	595	273	282	61,120
2070	595	273	281	61,401
2071	595	273	280	61,680
2072	595	273	279	61,959
2073	595	273	278	62,237
2074	595	273	276	62,513
2075	595	273	276	62,789
2076	595	273	275	63,064
2077	595	273	274	63,338
2078	595	273	273	63,611
2079	595	273	274	63,884
2080	595	273	272	64,157
2081	595	273	272	64,428
2082	595	273	271	64,700
2083	595	273	271	64,970
2084	595	273	270	65,241
2085	595	273	271	65,511
2086	595	273	270	65,781
2087	595	273	270	66,051
2088	595	273	269	66,320
2089	595	273	269	66,589
2090	595	273	268	66,857
2091	595	273	268	67,125
2092	595	273	268	67,393
2093	595	273	267	67,661
2094	595	273	267	67,928
2095	595	273	267	68,195
2096	595	273	267	68,462
2097	595	273	267	68,729
2098	595	273	267	68,996
2099	595	273	267	69,264
2100	595	273	267	69,531
Total	158,560	72,876	69,531	69,531
Average	826	380	362	N/A

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