

# **Simulating boreal forest carbon dynamics after stand-replacing fire disturbance: insights from a global process-based vegetation model**

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## **Supporting Materials**

**Table S1.** Carbon stock change and accumulated carbon fluxes for simulation of CO<sub>2</sub>FIX-CLIMFIX for the 19<sup>th</sup> and 20<sup>th</sup> "fire rotation" of the second spniup and the period after the most recent fire event. Fire carbon emission means the carbon emission for the fire at the beginning of each fire rotation. Mineral SOC: Mineral soil organic carbon stock. NEP-EMI-Cgrowth: NEP minus fire carbon emissions minus growth in the total carbon stocks, the small values in this column indicate that the carbon budget is closed in the model, the big values at site CA-SF1 for the period after most recent fire event is because the model uses yearly output timestep and the error of carbon stocks within the same year.

	<b>FRI</b>	<b>Aboveground litter (gCm<sup>-2</sup>)</b>	<b>Belowground litter (gCm<sup>-2</sup>)</b>	<b>Mineral SOC (gCm<sup>-2</sup>)</b>	<b>Total biomass carbon (gCm<sup>-2</sup>)</b>	<b>Carbon pool increase (gCm<sup>-2</sup>)</b>	<b>Fire carbon emission (gCm<sup>-2</sup>)</b>	<b>Accumulated NEP (gCm<sup>-2</sup>)</b>	<b>NEP-EMI-Cgrowth (gCm<sup>-2</sup>)</b>	<b>Accumulated GPP (gCm<sup>-2</sup>)</b>	<b>Accumulated TER (gCm<sup>-2</sup>)</b>	<b>Emission per year (gCm<sup>-2</sup>yr<sup>-1</sup>)</b>	<b>NEP per year (gCm<sup>-2</sup>yr<sup>-1</sup>)</b>	<b>Period length (yr)</b>
CA-NS1	<b>19th</b>	7	4	147	4	162	963	1123	-2	74013	72890	6	7	160
	<b>20th</b>	-17	-4	90	-155	-86	966	879	-1	73435	72556	6	5	160
	<b>Postfire</b>	5	2	147	41	195	936	1149	18	71525	70376	6	7	155
CA-SF1	<b>19</b>	28	6	64	31	129	3697	3844	18	127913	124069	23	24	160
	<b>20</b>	-109	-12	98	-65	-88	3774	3689	2	127860	124172	24	23	160
	<b>Postfire</b>	1180	770	-29	-6561	-4640	3683	232	1189	19068	18836	23	8	28
US-Bn1	<b>19</b>	7	5	29	14	54	486	541	1	37012	36472	3	3	160
	<b>20</b>	6	2	39	14	60	495	556	0	37433	36878	3	3	160
	<b>Postfire</b>	195	75	65	-361	-26	492	463	-3	19149	18686	3	6	83

**Table S2.** Carbon stock change and accumulated carbon fluxes for simulation of CO<sub>2</sub>FIX-CLIMVAR for the 19<sup>th</sup> and 20<sup>th</sup> "fire rotation" of the second sniup and the period after the most recent fire event. Fire carbon emission means the carbon emission for the fire at the beginning of each fire rotation. Mineral SOC: Mineral soil organic carbon stock. NEP-EMI-Cgrowth: NEP minus fire carbon emissions minus growth in the total carbon stocks, the small values in this column indicate that the carbon budget is closed in the model, the big values at site CA-SF1 for the period after most recent fire event is because the model uses yearly output timestep and the error of carbon stocks within the same year.

	<b>FRI</b>	<b>Aboveground litter (gCm<sup>-2</sup>)</b>	<b>Belowground litter (gCm<sup>-2</sup>)</b>	<b>Mineral SOC (gCm<sup>-2</sup>)</b>	<b>Total biomass carbon (gCm<sup>-2</sup>)</b>	<b>Carbon pool increase (gCm<sup>-2</sup>)</b>	<b>Fire carbon emission (gCm<sup>-2</sup>)</b>	<b>Accumulated NEP (gCm<sup>-2</sup>)</b>	<b>NEP-EMI-Cgrowth (gCm<sup>-2</sup>)</b>	<b>Accumulated GPP (gCm<sup>-2</sup>)</b>	<b>Accumulated TER (gCm<sup>-2</sup>)</b>	<b>Emission per year (gCm<sup>-2</sup>yr<sup>-1</sup>)</b>	<b>NEP per year (gCm<sup>-2</sup>yr<sup>-1</sup>)</b>	<b>Period length (yr)</b>
CA-NS1	<b>19th</b>	7	4	147	4	162	963	1123	-2	74013	72890	6	7	160
	<b>20th</b>	-17	-4	90	-155	-86	966	879	-1	73435	72556	6	5	160
	<b>Postfire</b>	-21	-30	-27	-288	-366	936	600	30	70078	69478	6	4	155
CA-SF1	<b>19</b>	28	6	64	31	129	3697	3844	18	127913	124069	23	24	160
	<b>20</b>	-1186	-80	208	-521	-1579	3774	2169	-27	124985	122817	24	14	160
	<b>Postfire</b>	1291	817	14	-6853	-4731	3047	-408	1276	18065	18473	19	-15	28
US-Bn1	<b>19</b>	7	5	29	14	54	486	541	1	37012	36472	3	3	160
	<b>20</b>	6	2	39	14	60	495	556	0	37433	36878	3	3	160
	<b>Postfire</b>	105	-50	-96	-602	-643	492	-164	-12	16509	16673	3	-2	83

**Table S3.** Carbon stock change and accumulated carbon fluxes for simulation of GPPCAL-CMCD for the 19<sup>th</sup> and 20<sup>th</sup> "fire rotation" of the second spniup and the period after the most recent fire event. Fire carbon emission means the carbon emission for the fire at the beginning of each fire rotation. Mineral SOC: Mineral soil organic carbon stock. NEP-EMI-Cgrowth: NEP minus fire carbon emissions minus growth in the total carbon stocks, the small values in this column indicate that the carbon budget is closed in the model, the big values at site CA-SF1 for the period after most recent fire event is because the model uses yearly output timestep and the error of carbon stocks within the same year.

	<b>FRI</b>	<b>Aboveground litter (gCm<sup>-2</sup>)</b>	<b>Belowground litter (gCm<sup>-2</sup>)</b>	<b>Mineral SOC (gCm<sup>-2</sup>)</b>	<b>Total biomass carbon (gCm<sup>-2</sup>)</b>	<b>Carbon pool increase (gCm<sup>-2</sup>)</b>	<b>Fire carbon emission (gCm<sup>-2</sup>)</b>	<b>Accumulated NEP (gCm<sup>-2</sup>)</b>	<b>NEP-EMI-Cgrowth (gCm<sup>-2</sup>)</b>	<b>Accumulated GPP (gCm<sup>-2</sup>)</b>	<b>Accumulated TER (gCm<sup>-2</sup>)</b>	<b>Emission per year (gCm<sup>-2</sup>yr<sup>-1</sup>)</b>	<b>NEP per year (gCm<sup>-2</sup>yr<sup>-1</sup>)</b>	<b>Period length (yr)</b>
CA-NS1	<b>19th</b>	7	4	147	4	162	963	1124	-1	74013	72890	6	7	160
	<b>20th</b>	-17	-4	90	-155	-86	966	880	0	73435	72556	6	5	160
	<b>Postfire</b>	1132	215	953	2097	4398	936	5324	-10	84248	78928	6	34	155
CA-SF1	<b>19</b>	28	6	64	31	129	3697	3847	20	127913	124069	23	24	160
	<b>20</b>	694	295	650	517	2156	3774	6028	98	134482	128459	24	38	160
	<b>Postfire</b>	951	850	144	-6166	-4222	4097	1107	1232	23714	22607	26	40	28
US-Bn1	<b>19</b>	7	5	29	14	54	486	541	1	37012	36472	3	3	160
	<b>20</b>	25	14	56	72	167	495	662	0	37972	37310	3	4	160
	<b>Postfire</b>	245	6	-40	-273	-63	516	416	-37	19423	19007	3	5	83