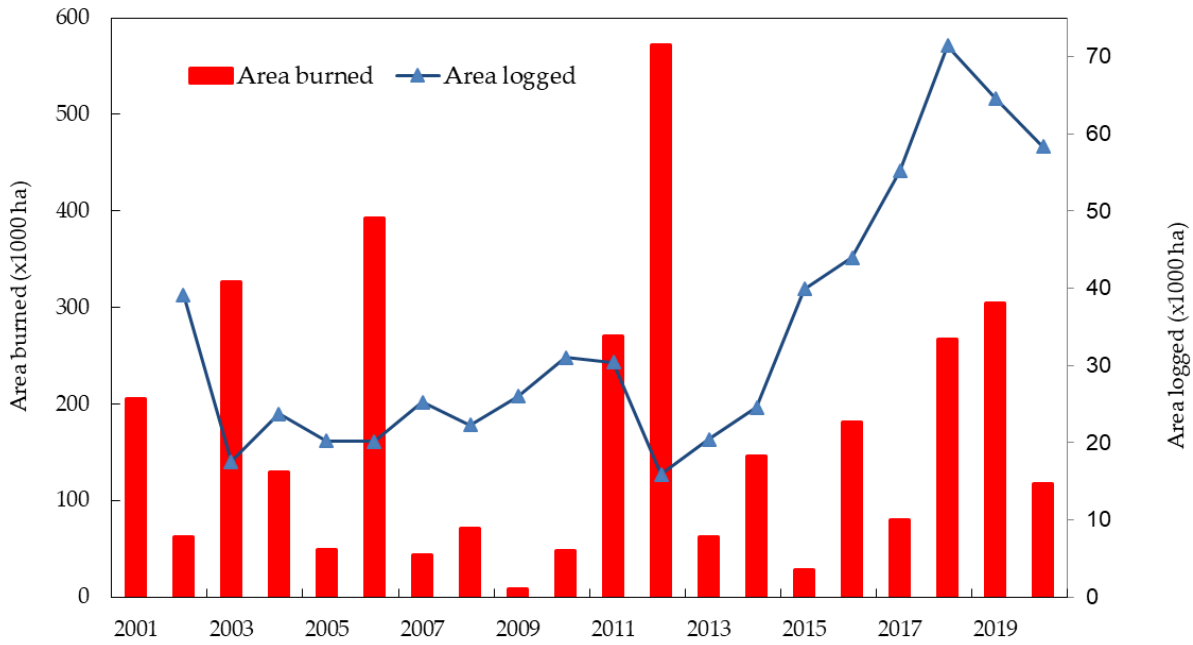

Figure S1. Area burned and logged in the Angara region based on satellite data during the 2001 – 2020 period.

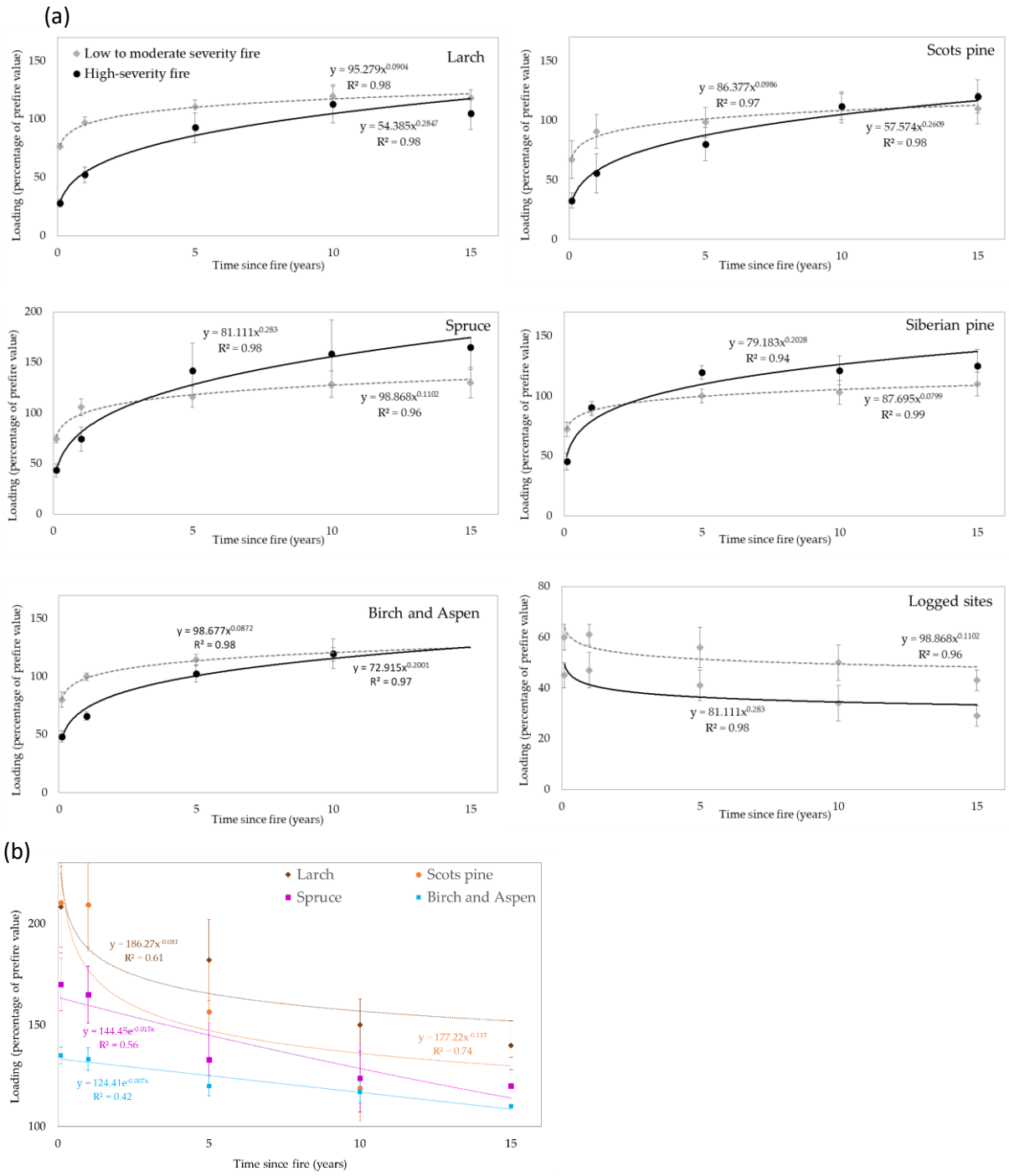

Figure S2 . Recovery of surface and ground fuel loads after fires of low to moderate and high severities in various forests and logged sites (a) and after clearcut loggings (b). The bars indicate standard deviation.

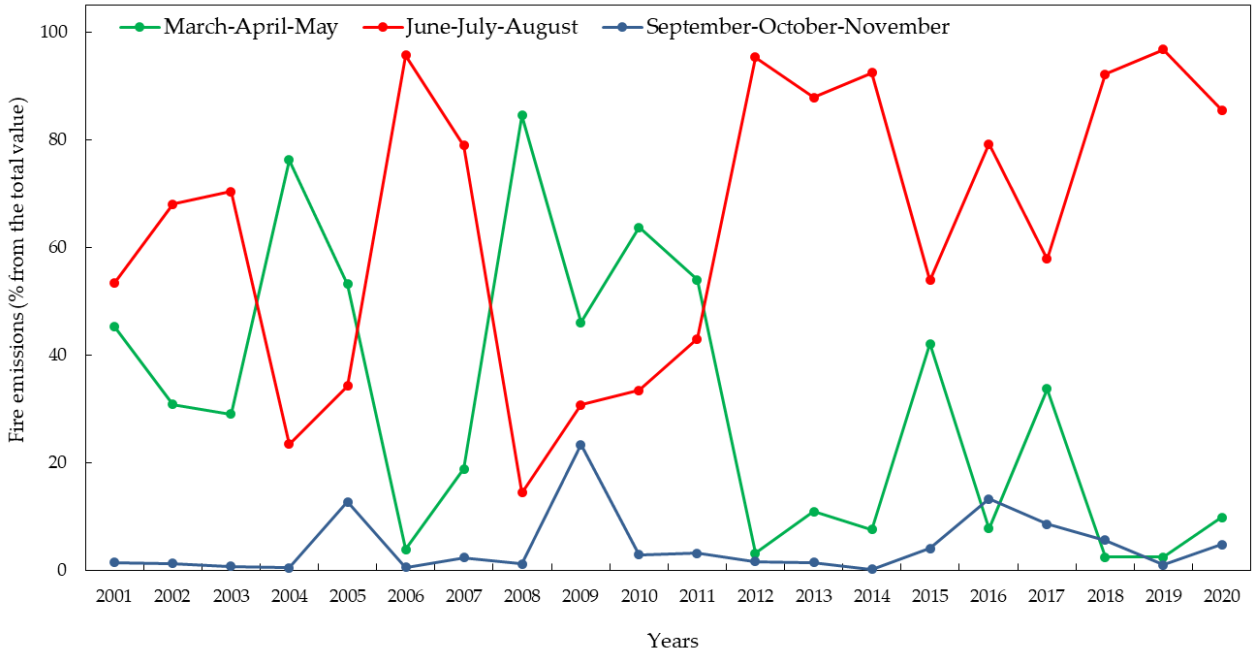

Figure S3. Distribution of carbon emissions from fires by seasons from 2001 to 2020.

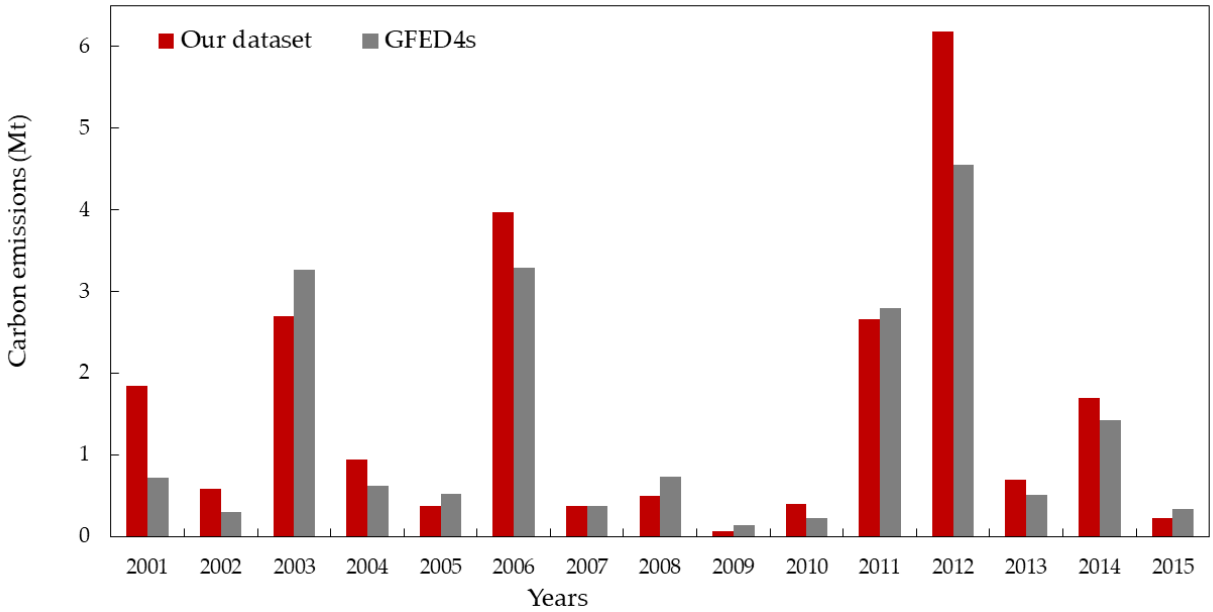

Figure S4. Comparison of annual carbon emissions due to fires from our estimates and GFED4s [66] in the Angara region for the period from 2001 to 2015.

Table S1. Surface and ground fuel loads in the dominant forest conditions of the Angara region.

Dominant tree species *	Slope, ° **	Soil ***	Fuel loads, t/ha					
			Grass, small shrubs	Moss, lichen	Litter	Duff	Down woody debris	Total
Larch	0–10	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	0.4	4.1	1.3	43.3	18.0	67.1
		Sod-carbonated (including leached and podzolised) and iron Sod-taiga soils (ferric derno-brownearths)	1.9	1.1	4.3	28.3	24.0	59.6
		Sod-podzolic soils	1.9	2.1	4.3	33.3	28.0	69.6
	>11	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	0.6	3.1	1.3	33.3	16.0	54.3
		Sod-carbonated (including leached and podzolised) and iron Sod-taiga soils (ferric derno-brownearths)	2.0	1.1	2.3	25.3	22.0	52.7
		Sod-podzolic soils	1.9	2.1	3.5	28.3	26.0	61.8
Larch, sparse stand	0–10	Iron sod-taiga soils (ferric derno-brownearths)	2.0	5.5	1.5	25.0	4.5	38.5
Scots pine	0–10	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	0.9	2.1	6.4	14.3	7.5	31.2
		Sod-carbonated (including leached and podzolised) and iron sod-taiga soils (ferric derno-brownearths)	2.1	0.0	6.3	21.3	12.0	41.7
		Sod-podzolic soils	0.8	0.2	3.4	20.6	11.6	36.6
	>11	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	0.9	2.1	5.4	11.3	6.4	26.1
		Sod-carbonated (including leached and podzolised) and iron sod-taiga soils (ferric derno-brownearths)	1.7	0.0	5.3	19.3	10.5	36.8
		Sod-podzolic soils	0.8	1.1	3.4	19.6	10.2	35.1
Spruce	0–10	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	0.5	7.4	0.5	41.0	30.0	79.4
		Meadow-swamp soils	2.1	3.2	1.5	189.7	4.0	200.5
		Sod-carbonated (including leached and podzolised) and iron sod-taiga soils (ferric derno-brownearths)	1.0	1.4	2.0	18.0	38.0	60.4

		Sod-podzolic soils	0.6	3.4	2.0	20.0	34.0	60.0
	>11	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	0.5	7.4	0.5	35.0	26.0	69.4
		Sod-carbonated (including leached and podzolised) and iron sod-taiga soils (ferric derno-brownearths)	1.4	1.4	2.0	16.0	35.0	55.8
		Sod-podzolic soils	0.6	3.4	2.0	20.0	30.0	56.0
Siberian pine	0–10	Iron sod-taiga soils	1.3	1.0	4.2	43.2	24.0	73.7
Birch	0–10	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	0.7	4.4	2.3	30.1	20.0	57.5
		Sod-carbonated (including leached and podzolised) and iron sod-taiga soils (ferric derno-brownearths)	1.0	0.0	6.2	24.9	18.0	50.1
		Sod-podzolic soils	1.5	2.5	4.0	28.0	22.0	58.0
	>11	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	0.7	4.4	2.3	29.1	17.0	53.5
		Sod-carbonated (including leached and podzolised) and iron sod-taiga soils (ferric derno-brownearths)	1.0	0.0	4.2	22.5	16.0	43.7
		Sod-podzolic soils	1.5	2.5	3.0	25.0	20.0	52.0
Poplar	0–10	Sod-podzolic soils	0.1	0.2	2.2	43.8	28.0	74.3
	>11	Sod-podzolic soils	1.1	0.0	4.2	40.0	24.0	69.3

*[41], ** [40], ***[47]

Table S2. Classification of natural forest-fire hazard (according to [53]).

Fire hazard class	Typically burned forest types, logged and unforested sites
1 - very high	Coniferous young stands. Scots pine forests with lichen and heather ground cover. Clear-cuts and burned sites with total tree mortality characterized by large amount of woody debris. Partially logged sites with high trees removal. Severely damaged forests (after windbreak, insects invasion, etc.)
2 - high	Scots pine forests with *Vaccinium vitis-idaea* ground cover (especially with pine and juniper high-density undergrowth). Larch forests with cedar elfin as ground cover.
3 - moderate	Scots pine forests with *Oxalis* spp. or *Vaccinium myrtillus* ground cover. Larch forests with *Vaccinium vitis-idaea* ground cover. Siberian pine forests with all ground cover except for sphagnum. Spruce forests with *Vaccinium vitis-idaea* or *Oxalis* spp. ground cover.
4 - low	Clear-cuts with *Filipendula* spp. or *Polytrichum commune* ground cover. Scots pine, larch and deciduous forests with grasses ground cover. Spruce forests with *Vaccinium myrtillus* ground cover. Scots pine and Siberian pine forests with *Polytrichum commune* ground cover. Birch forests with *Vaccinium vitis-idaea, Vaccinium myrtillus, Oxalis* spp. or sphagnum ground cover. Aspen forests with *Vaccinium myrtillus* or *Oxalis* spp.
5 - no hazard	Spruce, birch and aspen forests with *Polytrichum commune* ground cover. Spruce with sphagnum ground cover. Forests with Alnus spp. as dominant undergrowth.

Table S3. Fire hazard in the dominant site conditions of the Angara region.

Dominant tree species/Site type	Soil	Dominant ground vegetation	Fire hazard	
			Spring	Summer
Larch	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	feather moss-small shrubs	4	4
	Sod-carbonated (including leached and podzolised) and iron sod-taiga soils (ferric derno-brownearths)	grasses	2	4
	Sod-podzolic soils	grasses- feather moss	2	4
	Peat-muck high-humus non-gley taiga soils, peat and peaty gley bog soils (peat and peaty bog gleyzems)	sphagnum	5	5
Scots pine	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	feather moss-small shrubs	3	3
	Sod-carbonated (including leached and podzolised) and iron sod-taiga soils (ferric derno-brownearths)	grasses	1	4
	Sod-podzolic soils	grasses- feather moss-	2	4
	Peat-muck high-humus non-gley taiga soils, peat and peaty gley bog soils (peat and peaty bog gleyzems)	sphagnum	5	5
Spruce	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	feather moss-small shrubs	4	4
	Sod-carbonated (including leached and podzolised) and iron sod-taiga soils (ferric derno-brownearths)	grasses	3	5
	Sod-podzolic soils	grasses- feather moss	3	5
	Peat-muck high-humus non-gley taiga soils, peat and peaty gley bog soils (peat and peaty bog gleyzems)	sphagnum	5	5
	Meadow-swamp soils	grasses	2	5
Siberian pine	Iron sod-taiga soils	grasses	2	4
Birch	Iron-illuvial and humus-illuvial podzols, undifferentiated (illuvial high and low-humus podzols)	feather moss-small shrubs	4	4
	Sod-carbonated (including leached and podzolised) and iron sod-taiga soils (ferric derno-brownearths)	grasses	1	4
	Sod-podzolic soils	feather moss-grasses	2	4
	Peat-muck high-humus non-gley taiga soils, peat and peaty gley bog soils (peat and peaty bog gleyzems)	sphagnum	5	5
Aspen	Sod-podzolic soils	feather moss-grasses	3	5

Clear-cuts, severely burned forests with high to total tree mortality	All types, except for peat-muck high-humus non-gley taiga soils, peat and peaty gley bog soils (peat and peaty bog gleyzems)	grasses	1	2
	Peat-muck high-humus non-gley taiga soils, peat and peaty gley bog soils (peat and peaty bog gleyzems)	grasses	1	4
Grasslands	All types	grasses	1	4
Bogs	All types	sphagnum	5	5

Notes: 1. Fire hazard at the sites located on the slopes more than 10° is increased by 1 class (e.g., from 4 to 3 class). 2. Fire hazard at the forests burned by low-severity fires is equivalent to fire hazard at sod-carbonated soils of the same dominant tree species.

Table S4. Spring and summer fire hazard (mean value ± standard deviation) in the Angara region from 2001 to 2020. Hazard units are defined in Table S2.

Year	**Fire hazard**	
	Spring	**Summer**
2001	2.06 ± 1.14	3.81 ± 0.81
2002	2.05 ± 1.14	3.80 ± 0.82
2003	2.04 ± 1.14	3.79 ± 0.83
2004	2.03 ± 1.14	3.78 ± 0.84
2005	2.02 ± 1.14	3.78 ± 0.85
2006	1.99 ± 1.12	3.75 ± 0.87
2007	1.99 ± 1.12	3.75 ± 0.88
2008	1.99 ± 1.12	3.74 ± 0.88
2009	1.98 ± 1.12	3.74 ± 0.89
2010	1.98 ± 1.12	3.73 ± 0.89
2011	1.97 ± 1.11	3.72 ± 0.90
2012	1.94 ± 1.11	3.68 ± 0.94
2013	1.94 ± 1.11	3.68 ± 0.95
2014	1.93 ± 1.10	3.67 ± 0.96
2015	1.92 ± 1.10	3.66 ± 0.96
2016	1.91 ± 1.10	3.64 ± 0.98
2017	1.90 ± 1.10	3.63 ± 0.99
2018	1.89 ± 1.09	3.60 ± 1.01
2019	1.86 ± 1.09	3.57 ± 1.04
2020	1.86 ± 1.08	3.56 ± 1.04
Average	1.96 ± 0.06	3.70 ± 0.08