



Seal River Watershed Soil Organic Carbon Stock Assessment

Introduction:

The Seal River watershed spans roughly 50,000 km² and covers three ecozones: The Taiga Shield, Boreal Shield, and Hudson Plains. This watershed is situated in the Boreal forest region of Canada, which is one of the world's largest terrestrial carbon banks (Carlson et al., 2009). A large portion of the carbon in Canada's Boreal forest region is stored below ground in soils, particularly in peatlands where organic matter has accumulated over millennia. Here we assess the area of peatland, mineral wetlands, and open water relative to upland landscapes in the Seal River watershed and their associated carbon stocks.

Methods:

We used the Peatlands of Canada Database (Tarnocai et al., 2011) to assess the area of peatlands (bogs and fens) in individual polygons. We then used the Hybrid Wetland Layer (Ducks Unlimited Canada, 2011) to determine the extent of freshwater mineral wetlands and open water areas in the Seal River watershed. In the HWL, wetlands are not classified so we estimated mineral wetland cover by subtracting the peatland extent for each polygon based on the Peatland of Canada Database from the total wetland area of wetlands determined by the HWL. Occasionally, due to issues with accuracy and misclassification between these datasets this resulted in negative values. Where this occurred, we assumed mineral wetland extent to be 0. Open water areas were determined using the HWL. Lastly, to determine the portion of upland in each polygon we subtracted the sum of peatland area, freshwater mineral wetland area, and open water area from the total polygon area.

Carbon stocks for each landscape were calculated. For peatlands, carbon density (tonnes/ha) was derived directly from the Peatlands of Canada Database. Carbon stocks for both the mineral wetlands and open water areas were estimated using a fixed density of 289 tonnes of C/ha based on previous work conducted by Bridgman et al., (2006). Lastly, upland carbon stocks were estimated based on the mid-range of carbon density determined for soils in the Boreal forest region (Badiou and Witherly, 2015).

Results and Discussion:

A breakdown of wetland (bog, fen, and mineral wetland), open water, and upland area in the Seal River watershed is provided in Table 1. The associated carbon stocks for each landscape type are reported in Table 2. Within the Seal River watershed peatlands comprise 27.6% of the landscape (16.3% bog and 11.3% fen), while freshwater mineral wetlands cover an additional 8.5% of the watershed. In total, wetlands account for 36.2% of the watershed. The watershed



also has numerous lakes and shallow open water areas that account for another 20% of the landscape. Upland landscapes account for the remaining 43.9% of the watershed.

Although peatlands account for only 27.6% of the watershed area they contain nearly 1 billion tonnes of carbon (377 million tonnes in bogs and 583 million tonnes in fens), accounting for 56.1% of soil organic carbon stocks. Freshwater mineral wetlands in the watershed contain an additional 122 million tonnes of carbon and account for 7.1% of soil organic carbon stocks in the watershed. In total, wetlands in the Seal River watershed contain approximately 63% of soil organic carbon stocks. The remaining soil organic carbon stocks are almost evenly split between open water areas (17%, 287 million tonnes of C) and upland areas (20%, 343 million tonnes of C). Overall, we estimate the Seal River watershed contains approximately 1.7 billion tonnes of carbon in its soils and sediments. The distribution of these stocks is quite variable across the watershed and largely tracks the distribution of peatlands (Figure 1).

References:

Badiou, P. and S. Witherly. 2015. Manitoba Boreal Wetland Carbon Inventory. A report prepared for the Government of Manitoba, Department of Conservation and Water Stewardships. 15 pp.

Ducks Unlimited Canada. May 2011. Hybrid Wetland Layer User Guide. 18 pp. Hybrid Wetland Layer Version 2.1.1 Ducks Unlimited Canada, Edmonton, Alberta.

Carlson, M., Wells, J. and Roberts, D., 2009. *The carbon the world forgot: conserving the capacity of Canada's Boreal Forest region to mitigate and adapt to climate change*. Boreal Songbird Initiative and Canadian Boreal Initiative, Seattle, WE, USA and Ottawa, Canada.

Tarnocai, C., I.M. Kettles and B. Lacelle. 2011. Peatlands of Canada; Geological Survey of Canada, Open File 6561 (digital database); CD-ROM.



Table 1. Area and proportion of various land cover in the Seal River watershed.

POLYGON ID	Watershed	Ecozone	Polygon area							Freshwater mineral wetland	Freshwater mineral wetland	Open water	Open water
			(ha)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
460263	South Seal	Boreal Shield	368	211	57	107	29	22	6	0	0	29	8
460263	South Seal	Boreal Shield	1,476	219	15	428	29	89	6	0	0	741	50
460263	South Seal	Boreal Shield	92,758	45,374	49	26,900	29	5,565	6	613	1	14,306	15
460264	South Seal	Boreal Shield	239	124	52	62	26	5	2	28	12	20	8
460264	South Seal	Boreal Shield	19,458	11,548	59	5,059	26	389	2	0	0	2,461	13
460265	South Seal	Taiga Shield	10,849	6,251	58	2,929	27	325	3	512	5	831	8
460265	South Seal	Taiga Shield	18,610	9,678	52	5,025	27	558	3	0	0	3,349	18
460266	South Seal	Taiga Shield	5,867	2,882	49	1,467	25	59	1	380	6	1,079	18
460267	South Seal	Taiga Shield	119,741	47,699	40	45,502	38	11,974	10	0	0	14,566	12
460268	South Seal	Taiga Shield	5,262	1,803	34	2,210	42	316	6	156	3	777	15
460269	South Seal	Taiga Shield	4,995	1,920	38	1,349	27	549	11	242	5	935	19
460270	South Seal	Taiga Shield	81,315	36,602	45	23,581	29	7,318	9	986	1	12,827	16
460291	Seal	Hudson Plain	16,998	251	1	7,309	43	3,909	23	0	0	5,528	33
460297	Seal	Taiga Shield	16,297	7,171	44	4,237	26	1,793	11	0	0	3,096	19
460297	South Seal	Taiga Shield	40,267	12,977	32	10,470	26	4,429	11	3,182	8	9,209	23
460298	South Seal	Taiga Shield	844	423	50	152	18	135	16	109	13	25	3
460298	North Seal	Taiga Shield	263,121	134,367	51	47,362	18	42,099	16	12,189	5	27,103	10
460298	South Seal	Taiga Shield	536,330	235,116	44	96,539	18	85,813	16	61,250	11	57,612	11
460299	South Seal	Taiga Shield	12,615	6,141	49	2,271	18	1,766	14	0	0	2,437	19
460299	North Seal	Taiga Shield	141,581	73,375	52	25,485	18	19,821	14	1,909	1	20,991	15
460299	South Seal	Taiga Shield	149,852	68,694	46	26,973	18	20,979	14	9,519	6	23,686	16
460300	North Seal	Taiga Shield	22,221	11,555	52	4,000	18	2,000	9	925	4	3,742	17
460301	North Seal	Taiga Shield	52,030	24,767	48	10,406	20	4,162	8	3,054	6	9,640	19
460302	North Seal	Taiga Shield	45,842	25,987	57	9,627	21	1,834	4	868	2	7,526	16
460304	Seal	Taiga Shield	1,812	649	36	290	16	217	12	82	5	573	32
460304	North Seal	Taiga Shield	2,221	1,217	55	355	16	266	12	0	0	382	17
460304	South Seal	Taiga Shield	101,004	40,943	41	16,161	16	12,121	12	18,347	18	13,433	13
460304	Seal	Taiga Shield	263,851	112,977	43	42,216	16	31,662	12	19,757	7	57,238	22
460305	Seal	Taiga Shield	20,084	4,839	24	4,820	24	1,808	9	3,924	20	4,692	23
460307	Seal	Taiga Shield	128,434	58,058	45	26,971	21	19,265	15	4,514	4	19,626	15
460308	Seal	Taiga Shield	103,037	10,039	10	24,729	24	22,668	22	25,806	25	19,795	19
460309	Seal	Southern Arctic	19,585	3,538	18	2,350	12	4,113	21	7,170	37	2,414	12
460312	Seal	Taiga Shield	12,297	230	2	2,214	18	1,230	10	6,529	53	2,095	17
460314	Seal	Taiga Shield	26,647	3,157	12	0	0	4,530	17	11,944	45	7,016	26
460314	Seal	Taiga Shield	49,996	6,156	12	0	0	8,499	17	24,877	50	10,464	21
460315	Seal	Taiga Shield	6,128	71	1	306	5	858	14	2,737	45	2,156	35
460315	Seal	Taiga Shield	20,928	270	1	1,046	5	2,930	14	11,946	57	4,735	23



Table 1. (Continued)

POLYGON ID	Watershed	Ecozone	Polygon							Freshwater mineral wetland	Freshwater mineral wetland	Open water	Open water
			area (ha)	Upland (ha)	Upland (%)	Bog (ha)	Bog (%)	Fen (ha)	Fen (%)	(ha)	(%)	(ha)	(%)
460316	Seal	Taiga Shield	23	0	0	2	8	1	6	20	86	0	0
460316	North Seal	Taiga Shield	2,357	1,723	73	189	8	141	6	89	4	215	9
460316	Seal	Taiga Shield	117,469	21,624	18	9,397	8	7,048	6	48,419	41	30,981	26
460317	North Seal	Taiga Shield	103,132	50,264	49	13,407	13	13,407	13	0	0	26,053	25
460336	South Seal	Boreal Shield	833	509	61	183	22	8	1	0	0	132	16
460336	South Seal	Boreal Shield	1,316	705	54	290	22	13	1	90	7	219	17
460338	South Seal	Taiga Shield	41,422	18,006	43	12,841	31	4,142	10	0	0	6,433	16
460338	South Seal	Taiga Shield	208,752	102,422	49	64,713	31	20,875	10	0	0	20,742	10
460342	Seal	Hudson Plain	1,959	93	5	431	22	509	26	561	29	364	19
460344	South Seal	Taiga Shield	28,710	13,615	47	4,594	16	3,445	12	3,596	13	3,460	12
460346	South Seal	Taiga Shield	16,577	6,118	37	3,481	21	2,652	16	0	0	4,325	26
460346	North Seal	Taiga Shield	21,274	11,436	54	4,468	21	3,404	16	0	0	1,966	9
460350	North Seal	Taiga Shield	6,236	3,422	55	998	16	624	10	95	2	1,097	18
460352	North Seal	Taiga Shield	12,577	7,239	58	2,515	20	880	7	277	2	1,665	13
460353	North Seal	Taiga Shield	11,741	5,820	50	1,409	12	1,409	12	0	0	3,103	26
460354	North Seal	Taiga Shield	104	77	74	10	10	11	11	0	0	5	5
460354	Seal	Taiga Shield	4,020	2,150	53	402	10	442	11	0	0	1,026	26
460355	Seal	Taiga Shield	851	55	6	26	3	102	12	450	53	219	26
460357	Seal	Taiga Shield	21	0	0	0	1	4	18	13	62	4	19
460357	Seal	Taiga Shield	533	0	0	5	1	96	18	158	30	274	51
460357	Seal	Taiga Shield	1,780	40	2	18	1	320	18	490	28	911	51
460357	Seal	Taiga Shield	6,707	283	4	67	1	1,207	18	3,387	51	1,762	26
460357	Seal	Taiga Shield	10,096	144	1	101	1	1,817	18	5,345	53	2,689	27
460360	Seal	Taiga Shield	763	0	0	15	2	76	10	429	56	242	32
460360	Seal	Taiga Shield	68,869	4,972	7	1,377	2	6,887	10	38,619	56	17,013	25
460361	North Seal	Taiga Shield	2,529	1,264	50	253	10	278	11	225	9	509	20
460361	Seal	Taiga Shield	4,303	2,217	52	430	10	473	11	0	0	1,182	27
460363	North Seal	Taiga Shield	41,835	20,359	49	4,184	10	4,184	10	1,333	3	11,776	28
460418	North Seal	Taiga Shield	1,576	548	35	0	0	0	0	301	19	727	46
460430	Seal	Taiga Shield	33	0	0	5	15	4	11	0	0	25	74
460430	Seal	Taiga Shield	1,066	382	36	160	15	117	11	280	26	127	12
460430	Seal	Taiga Shield	4,235	1,370	32	635	15	466	11	795	19	969	23
460430	Seal	Taiga Shield	71,351	35,255	49	10,703	15	7,849	11	6,586	9	10,958	15
460430	Seal	Taiga Shield	177,912	102,130	57	26,687	15	19,570	11	2,342	1	27,183	15
460432	South Seal	Boreal Shield	651	311	48	156	24	20	3	101	16	63	10
460432	South Seal	Boreal Shield	5,115	2,346	46	1,228	24	153	3	303	6	1,085	21
465000	Seal	Taiga Shield	8,900	26	0	0	0	0	0	2,156	24	6,718	75



Table 1. (Continued)

POLYGON ID	Watershed	Ecozone	Polygon							Freshwater	Freshwater	Open	Open
			area (ha)	Upland (ha)	Upland (%)	Bog (ha)	Bog (%)	Fen (ha)	Fen (%)	mineral wetland (ha)	mineral wetland (%)	water (ha)	water (%)
465000	Seal	Taiga Shield	3,105	10	0	0	0	0	0	1,554	50	1,540	50
465000	Seal	Taiga Shield	821	5	1	0	0	0	0	350	43	466	57
465000	Seal	Taiga Shield	29	0	0	0	0	0	0	10	33	19	67
465000	Seal	Taiga Shield	104	0	0	0	0	0	0	51	49	53	51
465000	Seal	Taiga Shield	38,748	862	2	0	0	0	0	11,539	30	26,347	68
465000	Seal	Taiga Shield	2,385	211	9	0	0	0	0	1,163	49	1,011	42
465000	Seal	Taiga Shield	1,396	0	0	0	0	0	0	323	23	1,073	77
465000	Seal	Taiga Shield	2,321	12	1	0	0	0	0	1,246	54	1,063	46
465000	Seal	Taiga Shield	4,244	1,359	32	0	0	0	0	1,253	30	1,632	38
465000	Seal	Taiga Shield	2,099	158	8	0	0	0	0	1,134	54	807	38
465000	Seal	Taiga Shield	2,029	472	23	0	0	0	0	379	19	1,178	58
465000	Seal	Taiga Shield	4,139	421	10	0	0	0	0	934	23	2,783	67
465000	Seal	Taiga Shield	5,780	543	9	0	0	0	0	1,526	26	3,711	64
465000	Seal	Taiga Shield	519	2	0	0	0	0	0	87	17	430	83
465000	Seal	Taiga Shield	2,110	383	18	0	0	0	0	754	36	974	46
465000	Seal	Taiga Shield	2,214	234	11	0	0	0	0	224	10	1,756	79
465000	Seal	Taiga Shield	174	8	5	0	0	0	0	69	40	97	56
465000	Seal	Taiga Shield	2,472	466	19	0	0	0	0	256	10	1,751	71
465000	Seal	Southern Arctic	708	29	4	0	0	0	0	587	83	92	13
465000	Seal	Taiga Shield	3,575	1,254	35	0	0	0	0	311	9	2,010	56
465000	Seal	Taiga Shield	3,280	214	7	0	0	0	0	2,017	62	1,048	32
465000	Seal	Taiga Shield	15,695	2,809	18	0	0	0	0	1,877	12	11,008	70
465000	Seal	Taiga Shield	3,383	715	21	0	0	0	0	1,181	35	1,487	44
465000	North Seal	Taiga Shield	5,941	2,072	35	0	0	0	0	1,176	20	2,693	45
465000	North Seal	Taiga Shield	111	71	64	0	0	0	0	17	15	24	21
465000	North Seal	Taiga Shield	11,428	1,146	10	0	0	0	0	1,250	11	9,032	79
465000	North Seal	Taiga Shield	4,528	991	22	0	0	0	0	449	10	3,089	68
465000	North Seal	Taiga Shield	8,064	2,923	36	0	0	0	0	1,382	17	3,760	47
465000	North Seal	Taiga Shield	2,793	885	32	0	0	0	0	610	22	1,299	46
465000	North Seal	Taiga Shield	11,417	2,303	20	0	0	0	0	1,245	11	7,868	69
465000	North Seal	Taiga Shield	3,180	1,141	36	0	0	0	0	542	17	1,496	47
465000	North Seal	Taiga Shield	4,883	1,318	27	0	0	0	0	684	14	2,881	59
465000	North Seal	Taiga Shield	9,968	3,642	37	0	0	0	0	1,286	13	5,041	51
465000	North Seal	Taiga Shield	20,088	5,734	29	0	0	0	0	3,858	19	10,495	52
465000	North Seal	Taiga Shield	4,043	1,226	30	0	0	0	0	996	25	1,821	45
465000	North Seal	Taiga Shield	5,272	375	7	0	0	0	0	576	11	4,320	82
465000	North Seal	Taiga Shield	6,178	1,787	29	0	0	0	0	766	12	3,625	59



Table 1. (Continued)

POLYGON ID	Watershed	Ecozone	Polygon							Freshwater	Freshwater	Open	Open
			area (ha)	Upland (ha)	Upland (%)	Bog (ha)	Bog (%)	Fen (ha)	Fen (%)	mineral wetland (ha)	mineral wetland (%)	water (ha)	water (%)
465000	North Seal	Taiga Shield	2,476	517	21	0	0	0	0	327	13	1,632	66
465000	North Seal	Taiga Shield	15,806	4,573	29	0	0	0	0	2,051	13	9,182	58
465000	North Seal	Taiga Shield	2,413	1,023	42	0	0	0	0	446	18	944	39
465000	North Seal	Taiga Shield	3,951	726	18	0	0	0	0	364	9	2,861	72
465000	North Seal	Taiga Shield	3,353	905	27	0	0	0	0	233	7	2,215	66
465000	North Seal	Taiga Shield	3,280	1,228	37	0	0	0	0	658	20	1,394	43
465000	North Seal	Taiga Shield	2,536	857	34	0	0	0	0	448	18	1,230	49
465000	North Seal	Taiga Shield	2,161	406	19	0	0	0	0	577	27	1,178	55
465000	North Seal	Taiga Shield	495	345	70	0	0	0	0	16	3	134	27
465000	North Seal	Taiga Shield	9,835	2,868	29	0	0	0	0	973	10	5,993	61
465000	North Seal	Taiga Shield	376	182	48	0	0	0	0	79	21	116	31
465000	North Seal	Taiga Shield	2,725	1,003	37	0	0	0	0	483	18	1,238	45
465000	North Seal	Taiga Shield	3,105	857	28	0	0	0	0	192	6	2,055	66
465000	North Seal	Taiga Shield	4,302	1,197	28	0	0	0	0	546	13	2,559	59
465000	North Seal	Taiga Shield	2,987	537	18	0	0	0	0	537	18	1,914	64
465000	South Seal	Taiga Shield	104	36	35	0	0	0	0	52	50	16	15
465000	South Seal	Taiga Shield	35,976	5,904	16	0	0	0	0	5,518	15	24,554	68
465000	South Seal	Taiga Shield	2,342	597	25	0	0	0	0	717	31	1,028	44
465000	South Seal	Taiga Shield	2,415	636	26	0	0	0	0	202	8	1,577	65
465000	South Seal	Taiga Shield	4,281	565	13	0	0	0	0	621	15	3,095	72
465000	South Seal	Taiga Shield	2,536	725	29	0	0	0	0	1,118	44	693	27
465000	South Seal	Taiga Shield	3,578	697	19	0	0	0	0	697	19	2,184	61
465000	South Seal	Taiga Shield	10,256	3,436	34	0	0	0	0	2,213	22	4,607	45
465000	South Seal	Taiga Shield	30,934	9,275	30	0	0	0	0	4,500	15	17,159	55
465000	South Seal	Taiga Shield	2,675	1,103	41	0	0	0	0	469	18	1,102	41
465000	South Seal	Boreal Shield	3,001	1,000	33	0	0	0	0	418	14	1,583	53
465000	South Seal	Taiga Shield	2,547	938	37	0	0	0	0	883	35	726	28
465000	South Seal	Taiga Shield	4,726	2,007	42	0	0	0	0	497	11	2,222	47
465000	South Seal	Taiga Shield	1,227	216	18	0	0	0	0	43	3	969	79
465000	South Seal	Taiga Shield	2,434	1,368	56	0	0	0	0	179	7	888	36
465000	South Seal	Taiga Shield	2,122	603	28	0	0	0	0	981	46	538	25
465000	South Seal	Taiga Shield	2,953	1,432	48	0	0	0	0	261	9	1,260	43
465000	South Seal	Boreal Shield	3,109	1,700	55	0	0	0	0	295	10	1,113	36
645000	Seal	Southern Arctic	415	104	25	0	0	0	0	289	70	22	5
980001	South Seal	Taiga Shield	42,168	22,242	53	5,904	14	4,638	11	0	0	9,384	22
980001	Seal	Taiga Shield	157,915	82,690	52	22,108	14	17,371	11	620	0	35,127	22
980001	North Seal	Taiga Shield	974,383	556,252	57	136,414	14	107,182	11	769	0	173,767	18



Table 2. Carbon stock (tonnes of C) and proportion of C stock contained in various land cover across the Seal River watershed.

POLYGON			Upland Carbon Stock (tonnes)	Upland Carbon (%)	Bog Carbon Stock (tonnes)	Bog Carbon (%)	Fen Carbon Stock (tonnes)	Fen Carbon (%)	Freshwater mineral wetland Carbon Stock (tonnes)	Freshwater mineral wetland Carbon (%)	Open water Carbon Stock (tonnes)	Open water Carbon (%)	Total Carbon Stock (tonnes)
ID	Watershed	Ecozone											
460263	South Seal	Boreal Shield	33,228	29	44,643	38	30,227	26	0	0	8,298	7	116,397
460263	South Seal	Boreal Shield	34,562	6	179,084	33	121,256	22	0	0	214,049	39	548,950
460263	South Seal	Boreal Shield	7,162,329	24	11,251,966	37	7,618,596	25	177,177	1	4,134,311	14	30,344,378
460264	South Seal	Boreal Shield	19,567	29	25,991	39	7,522	11	8,128	12	5,776	9	66,983
460264	South Seal	Boreal Shield	1,822,892	35	2,116,125	40	612,449	12	0	0	711,303	14	5,262,769
460265	South Seal	Taiga Shield	986,735	32	1,225,313	39	512,244	16	148,074	5	240,195	8	3,112,561
460265	South Seal	Taiga Shield	1,527,746	28	2,101,803	38	878,661	16	0	0	967,765	18	5,475,975
460266	South Seal	Taiga Shield	454,863	29	598,968	38	92,329	6	109,936	7	311,912	20	1,568,008
460267	South Seal	Taiga Shield	7,529,285	19	18,582,437	47	9,346,407	24	0	0	4,209,716	11	39,667,845
460268	South Seal	Taiga Shield	284,588	18	816,156	50	246,418	15	45,120	3	224,560	14	1,616,843
460269	South Seal	Taiga Shield	303,058	10	2,026,843	65	428,844	14	69,981	2	270,109	9	3,098,834
460270	South Seal	Taiga Shield	5,777,633	23	9,630,334	38	5,712,306	23	284,899	1	3,707,049	15	25,112,222
460291	Seal	Hudson Plain	39,602	0	5,686,358	55	3,074,239	30	0	0	1,597,673	15	10,397,871
460297	Seal	Taiga Shield	1,131,876	19	1,730,390	29	2,245,239	37	0	0	894,814	15	6,002,320
460297	South Seal	Taiga Shield	2,048,464	13	4,275,641	28	5,547,786	36	919,721	6	2,661,317	17	15,452,929
460298	South Seal	Taiga Shield	66,712	19	62,059	18	184,905	52	31,563	9	7,324	2	352,563
460298	North Seal	Taiga Shield	21,209,831	19	19,342,081	18	57,629,700	53	3,522,739	3	7,832,908	7	109,537,259
460298	South Seal	Taiga Shield	37,113,122	16	39,425,749	17	117,468,954	51	17,701,123	8	16,649,884	7	228,358,831
460299	South Seal	Taiga Shield	969,371	18	927,344	17	2,779,527	52	0	0	704,360	13	5,380,601
460299	North Seal	Taiga Shield	11,582,206	19	10,407,646	17	31,194,820	52	551,676	1	6,066,512	10	59,802,860
460299	South Seal	Taiga Shield	10,843,403	17	11,015,639	17	33,017,155	51	2,751,012	4	6,845,206	11	64,472,415
460300	North Seal	Taiga Shield	1,823,886	29	1,633,495	26	1,561,038	25	267,461	4	1,081,310	17	6,367,190
460301	North Seal	Taiga Shield	3,909,498	26	4,249,700	28	3,248,956	22	882,610	6	2,786,064	18	15,076,828
460302	North Seal	Taiga Shield	4,102,006	34	3,931,496	33	1,431,278	12	250,963	2	2,175,121	18	11,890,864
460304	Seal	Taiga Shield	102,448	16	118,381	19	222,887	35	23,835	4	165,577	26	633,126
460304	North Seal	Taiga Shield	192,114	27	145,113	20	273,218	38	0	0	110,373	15	720,817
460304	South Seal	Taiga Shield	6,462,906	19	6,599,858	19	12,426,186	36	5,302,147	15	3,882,187	11	34,673,284
460304	Seal	Taiga Shield	17,833,456	20	17,240,657	19	32,460,638	36	5,709,876	6	16,541,817	18	89,786,445
460305	Seal	Taiga Shield	763,871	8	4,541,910	45	2,263,912	23	1,134,166	11	1,356,097	13	10,059,956
460307	Seal	Taiga Shield	9,164,453	22	11,014,736	26	15,149,370	36	1,304,488	3	5,671,890	13	42,304,938
460308	Seal	Taiga Shield	1,584,724	3	22,692,151	49	8,408,725	18	7,457,824	16	5,720,694	12	45,864,119
460309	Seal	Southern Arctic	558,481	8	2,368,164	33	1,525,686	21	2,072,223	29	697,584	10	7,222,137
460312	Seal	Taiga Shield	36,241	1	2,031,204	35	1,260,741	22	1,886,874	32	605,590	10	5,820,650
460314	Seal	Taiga Shield	498,323	5	0	0	3,562,233	37	3,451,918	36	2,027,563	21	9,540,037
460314	Seal	Taiga Shield	971,723	5	0	0	6,683,585	37	7,189,479	40	3,024,028	17	17,868,815
460315	Seal	Taiga Shield	11,139	0	281,161	11	879,544	34	791,036	31	623,052	24	2,585,931
460315	Seal	Taiga Shield	42,605	0	960,202	11	3,003,762	34	3,452,412	39	1,368,537	16	8,827,518



Table 2. (Continued)

POLYGON			Upland Carbon Stock	Upland Carbon	Bog Carbon Stock	Bog Carbon	Fen Carbon Stock	Fen Carbon	Freshwater mineral wetland Carbon Stock	Freshwater mineral wetland Carbon	Open water Carbon Stock	Open water Carbon	Total Carbon Stock
ID	Watershed	Ecozone	(tonnes)	(%)	(tonnes)	(%)	(tonnes)	(%)	(tonnes)	(%)	(tonnes)	(%)	(tonnes)
460316	Seal	Taiga Shield	0	0	1,703	19	1,427	16	5,748	65	18	0	8,896
460316	North Seal	Taiga Shield	271,977	40	173,025	26	144,982	21	25,749	4	62,093	9	677,826
460316	Seal	Taiga Shield	3,413,277	8	8,623,510	20	7,225,869	17	13,992,997	33	8,953,442	21	42,209,095
460317	North Seal	Taiga Shield	7,934,206	25	5,475,325	17	10,464,910	33	0	0	7,529,351	24	31,403,792
460336	South Seal	Boreal Shield	80,386	39	76,667	37	13,112	6	0	0	38,220	18	208,385
460336	South Seal	Boreal Shield	111,306	33	121,142	35	20,718	6	25,920	8	63,237	18	342,323
460338	South Seal	Taiga Shield	2,842,207	17	5,244,043	32	6,518,970	40	0	0	1,859,177	11	16,464,397
460338	South Seal	Taiga Shield	16,167,332	20	26,428,247	32	32,853,458	40	0	0	5,994,385	7	81,443,422
460342	Seal	Hudson Plain	14,613	1	434,177	43	296,425	29	162,255	16	105,328	10	1,012,798
460344	South Seal	Taiga Shield	2,149,188	19	4,328,444	39	2,689,114	24	1,039,182	9	999,867	9	11,205,795
460346	South Seal	Taiga Shield	965,765	10	5,231,988	55	2,070,226	22	0	0	1,249,940	13	9,517,919
460346	North Seal	Taiga Shield	1,805,223	15	6,714,525	57	2,656,846	23	0	0	568,230	5	11,744,824
460350	North Seal	Taiga Shield	540,185	19	1,499,598	52	486,749	17	27,528	1	317,100	11	2,871,160
460352	North Seal	Taiga Shield	1,142,703	19	3,780,570	61	687,188	11	79,946	1	481,303	8	6,171,710
460353	North Seal	Taiga Shield	918,683	18	2,117,501	42	1,099,700	22	0	0	896,744	18	5,032,627
460354	North Seal	Taiga Shield	12,224	32	15,660	41	8,946	23	0	0	1,407	4	38,237
460354	Seal	Taiga Shield	339,320	21	604,176	38	345,149	22	0	0	296,535	19	1,585,180
460355	Seal	Taiga Shield	8,618	3	38,390	12	79,750	25	130,097	41	63,278	20	320,133
460357	Seal	Taiga Shield	0	0	209	2	3,820	43	3,707	42	1,138	13	8,873
460357	Seal	Taiga Shield	0	0	5,375	2	98,438	43	45,784	20	79,085	35	228,682
460357	Seal	Taiga Shield	6,307	1	17,931	2	328,392	43	141,728	19	263,293	35	757,650
460357	Seal	Taiga Shield	44,671	2	67,584	2	1,237,746	44	978,981	34	509,324	18	2,838,306
460357	Seal	Taiga Shield	22,686	1	101,731	2	1,863,121	43	1,544,664	36	777,186	18	4,309,388
460360	Seal	Taiga Shield	0	0	13,996	5	59,970	22	123,887	46	70,064	26	267,917
460360	Seal	Taiga Shield	784,881	3	1,263,935	5	5,415,595	23	11,160,822	47	4,916,893	21	23,542,127
460361	North Seal	Taiga Shield	199,585	27	103,301	14	217,182	30	65,079	9	147,014	20	732,161
460361	Seal	Taiga Shield	349,982	28	175,739	14	369,475	30	0	0	341,699	28	1,236,895
460363	North Seal	Taiga Shield	3,213,633	27	1,708,510	14	3,265,451	27	385,273	3	3,403,353	28	11,976,221
460418	North Seal	Taiga Shield	86,462	23	0	0	0	0	87,014	23	210,154	55	383,631
460430	Seal	Taiga Shield	0	0	2,037	16	3,749	29	0	0	7,114	55	12,899
460430	Seal	Taiga Shield	60,315	17	65,289	18	120,195	33	80,864	22	36,639	10	363,303
460430	Seal	Taiga Shield	216,318	15	259,449	18	477,635	33	229,723	16	279,997	19	1,463,122
460430	Seal	Taiga Shield	5,564,969	24	4,370,838	19	8,046,521	35	1,903,494	8	3,166,937	14	23,052,759
460430	Seal	Taiga Shield	16,121,161	29	10,898,597	20	20,063,838	36	676,798	1	7,855,915	14	55,616,309
460432	South Seal	Boreal Shield	49,066	25	65,316	34	30,719	16	29,204	15	18,226	9	192,530
460432	South Seal	Boreal Shield	370,365	24	513,481	34	241,494	16	87,549	6	313,454	21	1,526,343
465000	Seal	Taiga Shield	4,037	0	0	0	0	0	623,078	24	1,941,546	76	2,568,660



Table 2. (Continued)

POLYGON ID	Watershed	Ecozone	Freshwater										Total Carbon Stock (tonnes)
			Upland Carbon Stock (tonnes)	Upland Carbon (%)	Bog Carbon Stock (tonnes)	Bog Carbon (%)	Fen Carbon Stock (tonnes)	Fen Carbon (%)	mineral wetland Carbon Stock (tonnes)	mineral wetland Carbon (%)	Open water Carbon Stock (tonnes)	Open water Carbon (%)	
465000	Seal	Taiga Shield	1,617	0	0	0	0	0	449,196	50	445,180	50	895,993
465000	Seal	Taiga Shield	799	0	0	0	0	0	101,037	43	134,733	57	236,569
465000	Seal	Taiga Shield	0	0	0	0	0	0	2,822	33	5,635	67	8,458
465000	Seal	Taiga Shield	0	0	0	0	0	0	14,780	49	15,303	51	30,083
465000	Seal	Taiga Shield	136,104	1	0	0	0	0	3,334,760	30	7,614,180	69	11,085,045
465000	Seal	Taiga Shield	33,333	5	0	0	0	0	336,214	51	292,038	44	661,586
465000	Seal	Taiga Shield	0	0	0	0	0	0	93,349	23	310,124	77	403,473
465000	Seal	Taiga Shield	1,864	0	0	0	0	0	360,002	54	307,323	46	669,189
465000	Seal	Taiga Shield	214,479	20	0	0	0	0	362,099	35	471,607	45	1,048,185
465000	Seal	Taiga Shield	24,973	4	0	0	0	0	327,645	56	233,183	40	585,801
465000	Seal	Taiga Shield	74,476	14	0	0	0	0	109,488	21	340,410	65	524,373
465000	Seal	Taiga Shield	66,473	6	0	0	0	0	270,011	24	804,396	71	1,140,880
465000	Seal	Taiga Shield	85,788	5	0	0	0	0	440,880	28	1,072,428	67	1,599,096
465000	Seal	Taiga Shield	252	0	0	0	0	0	25,034	17	124,354	83	149,640
465000	Seal	Taiga Shield	60,431	11	0	0	0	0	217,938	39	281,345	50	559,714
465000	Seal	Taiga Shield	36,874	6	0	0	0	0	64,832	11	507,609	83	609,314
465000	Seal	Taiga Shield	1,253	3	0	0	0	0	19,971	41	27,917	57	49,141
465000	Seal	Taiga Shield	73,519	11	0	0	0	0	73,945	11	505,947	77	653,410
465000	Seal	Southern Arctic	4,548	2	0	0	0	0	169,640	84	26,633	13	200,821
465000	Seal	Taiga Shield	197,956	23	0	0	0	0	89,965	10	580,876	67	868,796
465000	Seal	Taiga Shield	33,786	4	0	0	0	0	582,924	63	303,005	33	919,715
465000	Seal	Taiga Shield	443,425	11	0	0	0	0	542,547	13	3,181,328	76	4,167,300
465000	Seal	Taiga Shield	112,790	13	0	0	0	0	341,363	39	429,691	49	883,844
465000	North Seal	Taiga Shield	327,110	23	0	0	0	0	339,735	24	778,187	54	1,445,032
465000	North Seal	Taiga Shield	11,180	49	0	0	0	0	4,836	21	6,882	30	22,898
465000	North Seal	Taiga Shield	180,853	6	0	0	0	0	361,393	11	2,610,112	83	3,152,358
465000	North Seal	Taiga Shield	156,396	13	0	0	0	0	129,672	11	892,680	76	1,178,748
465000	North Seal	Taiga Shield	461,336	24	0	0	0	0	399,440	21	1,086,529	56	1,947,304
465000	North Seal	Taiga Shield	139,648	20	0	0	0	0	176,313	26	375,294	54	691,255
465000	North Seal	Taiga Shield	363,603	12	0	0	0	0	359,743	12	2,273,930	76	2,997,276
465000	North Seal	Taiga Shield	180,177	23	0	0	0	0	156,569	20	432,439	56	769,185
465000	North Seal	Taiga Shield	208,001	17	0	0	0	0	197,691	16	832,533	67	1,238,225
465000	North Seal	Taiga Shield	574,826	24	0	0	0	0	371,542	15	1,456,829	61	2,403,197
465000	North Seal	Taiga Shield	905,186	18	0	0	0	0	1,115,084	22	3,033,183	60	5,053,453
465000	North Seal	Taiga Shield	193,513	19	0	0	0	0	287,856	29	526,289	52	1,007,657
465000	North Seal	Taiga Shield	59,265	4	0	0	0	0	166,531	11	1,248,595	85	1,474,391
465000	North Seal	Taiga Shield	282,116	18	0	0	0	0	221,485	14	1,047,575	68	1,551,177



Table 2. (Continued)

POLYGON			Upland Carbon Stock	Upland Carbon	Bog Carbon Stock	Bog Carbon	Fen Carbon Stock	Fen Carbon	Freshwater mineral wetland Carbon Stock	Freshwater mineral wetland Carbon	Open water Carbon Stock	Open water Carbon	Total Carbon Stock
ID	Watershed	Ecozone	(tonnes)	(%)	(tonnes)	(%)	(tonnes)	(%)	(tonnes)	(%)	(tonnes)	(%)	(tonnes)
465000	North Seal	Taiga Shield	81,658	13	0	0	0	0	94,384	15	471,538	73	647,580
465000	North Seal	Taiga Shield	721,877	18	0	0	0	0	592,716	15	2,653,496	67	3,968,089
465000	North Seal	Taiga Shield	161,491	29	0	0	0	0	128,792	23	272,770	48	563,054
465000	North Seal	Taiga Shield	114,635	11	0	0	0	0	105,225	10	826,756	79	1,046,615
465000	North Seal	Taiga Shield	142,841	17	0	0	0	0	67,347	8	640,085	75	850,273
465000	North Seal	Taiga Shield	193,804	25	0	0	0	0	190,141	24	402,964	51	786,909
465000	North Seal	Taiga Shield	135,343	22	0	0	0	0	129,565	21	355,488	57	620,396
465000	North Seal	Taiga Shield	64,099	11	0	0	0	0	166,857	29	340,443	60	571,398
465000	North Seal	Taiga Shield	54,422	56	0	0	0	0	4,751	5	38,602	39	97,775
465000	North Seal	Taiga Shield	452,704	18	0	0	0	0	281,240	11	1,732,102	70	2,466,045
465000	North Seal	Taiga Shield	28,658	34	0	0	0	0	22,742	27	33,440	39	84,840
465000	North Seal	Taiga Shield	158,363	24	0	0	0	0	139,656	21	357,841	55	655,860
465000	North Seal	Taiga Shield	135,331	17	0	0	0	0	55,475	7	593,967	76	784,773
465000	North Seal	Taiga Shield	188,994	17	0	0	0	0	157,775	15	739,425	68	1,086,194
465000	North Seal	Taiga Shield	84,750	11	0	0	0	0	155,151	20	553,045	70	792,946
465000	South Seal	Taiga Shield	5,743	23	0	0	0	0	14,994	59	4,632	18	25,369
465000	South Seal	Taiga Shield	931,969	10	0	0	0	0	1,594,787	17	7,095,993	74	9,622,749
465000	South Seal	Taiga Shield	94,268	16	0	0	0	0	207,293	35	296,970	50	598,531
465000	South Seal	Taiga Shield	100,408	16	0	0	0	0	58,319	9	455,847	74	614,575
465000	South Seal	Taiga Shield	89,163	8	0	0	0	0	179,507	15	894,510	77	1,163,180
465000	South Seal	Taiga Shield	114,481	18	0	0	0	0	323,156	51	200,135	31	637,772
465000	South Seal	Taiga Shield	109,943	12	0	0	0	0	201,445	21	631,173	67	942,562
465000	South Seal	Taiga Shield	542,441	22	0	0	0	0	639,590	25	1,331,356	53	2,513,387
465000	South Seal	Taiga Shield	1,464,078	19	0	0	0	0	1,300,598	17	4,958,912	64	7,723,589
465000	South Seal	Taiga Shield	174,187	28	0	0	0	0	135,612	22	318,505	51	628,305
465000	South Seal	Boreal Shield	157,918	21	0	0	0	0	120,667	16	457,436	62	736,021
465000	South Seal	Taiga Shield	148,098	24	0	0	0	0	255,128	42	209,720	34	612,945
465000	South Seal	Taiga Shield	316,826	29	0	0	0	0	143,543	13	642,259	58	1,102,628
465000	South Seal	Taiga Shield	34,020	10	0	0	0	0	12,293	4	280,042	86	326,355
465000	South Seal	Taiga Shield	215,862	41	0	0	0	0	51,685	10	256,494	49	524,041
465000	South Seal	Taiga Shield	95,251	18	0	0	0	0	283,549	53	155,445	29	534,245
465000	South Seal	Taiga Shield	226,076	34	0	0	0	0	75,525	11	364,007	55	665,608
465000	South Seal	Boreal Shield	268,405	40	0	0	0	0	85,353	13	321,679	48	675,437
645000	Seal	Southern Arctic	16,394	15	0	0	0	0	83,412	78	6,479	6	106,285
980001	South Seal	Taiga Shield	3,510,940	29	2,410,940	20	3,620,568	30	0	0	2,711,909	22	12,254,358
980001	Seal	Taiga Shield	13,052,581	28	9,028,736	20	13,558,674	29	179,061	0	10,151,703	22	45,970,756
980001	North Seal	Taiga Shield	87,804,337	32	55,709,938	20	83,660,980	30	222,142	0	50,218,543	18	277,615,939



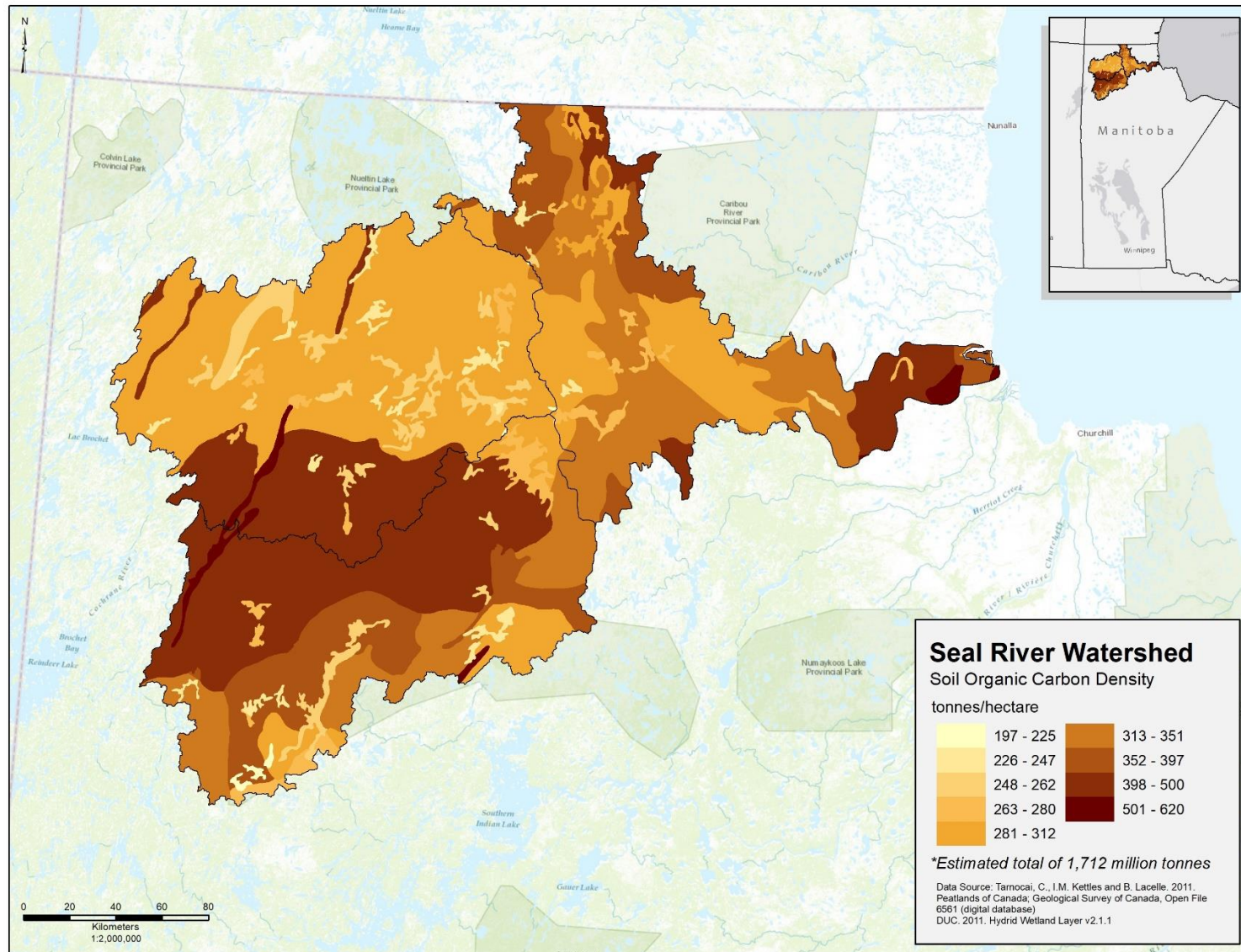


Figure 1. Distribution of carbon stocks in the Seal River watershed.

