

APPENDIX III

CATION CONCENTRATIONS AND DISTRIBUTIONS
IN BIOMASS, PRIMARY PRODUCTION, AND SOILS

	<i>Page</i>
Cation concentrations in shrub and tree tissues	185
Cation inventory in tree layer biomass	187
Cation inventory in tree layer production	189
Cation inventory in shrub layer biomass	191
Cation concentrations in herb layer tissues	193
Sunken Forest soil analyses	194

Cation Concentrations in Shrub and Tree Tissues
(Expressed as Percent of Tissue Dry weight \pm Standard Error)

	<i>Ilex opaca</i>	<i>Sassafras albidum</i>	<i>Amelanchier canadensis</i>	<i>Prunus serotina</i>	<i>Pyrus arbutifolia</i>	<i>Vaccinium corymbosum</i>	<i>Viburnum dentatum</i>
<i>Potassium</i>							
Fruit	0.5220	1.6885	0.7529				
Current twigs	0.4313 \pm 0.0478	1.0356 \pm 0.1005	0.2730 \pm 0.0331				
Current leaves	1.0274 \pm 0.0633	1.3207 \pm 0.0299	0.7798 \pm 0.1162				
Twigs + leaves				0.9862	1.4409	0.2802	1.1110
Branch wood + bark	0.1489 \pm 0.0141	0.1601 \pm 0.0239	0.1141 \pm 0.0164	0.1968	0.2011	0.1120	0.4607
Stem bark	0.1567 \pm 0.0170	0.2643 \pm 0.0313	0.1781 \pm 0.0269				
Stem wood	0.1100 \pm 0.0054	0.0162 \pm 0.0001	0.0380 \pm 0.0075				
Stem wood + bark				0.1361	0.1826	0.0937	0.2374
Roots	0.2889 \pm 0.0458	0.2437 \pm 0.0387	0.1999 \pm 0.0331	0.2032	0.1590	0.0908	0.1420
Dead branch wood	0.0349 \pm 0.0002	0.0247 \pm 0.0009	0.0277 \pm 0.0001				
<i>Sodium</i>							
Fruit	0.0579	0.1566	0.1299				
Current twigs	0.2424 \pm 0.0228	0.2075 \pm 0.0408	0.2577 \pm 0.0699				
Current leaves	0.2589 \pm 0.0238	0.2567 \pm 0.0258	0.3346 \pm 0.0551				
Twigs + leaves				0.1833	0.1264	0.1740	0.0769
Branch wood + bark	0.0832 \pm 0.0151	0.0397 \pm 0.0054	0.1202 \pm 0.0501	0.0901	0.0337	0.0980	0.0445
Stem bark	0.0552 \pm 0.0094	0.0483 \pm 0.0070	0.1204 \pm 0.0229				
Stem wood	0.0544 \pm 0.0089	0.0107 \pm 0.0001	0.0470 \pm 0.0084				
Stem wood + bark				0.0618	0.0307	0.0233	0.0450
Roots	0.2543 \pm 0.0291	0.3577 \pm 0.0754	0.1204 \pm 0.0212	0.1992	0.0678	0.0500	0.0627
Dead branch wood	0.0151 \pm 0.0001	0.0125 \pm 0.0001	0.0149 \pm 0.0001				

Cation Concentrations in Shrub and Tree Tissues (continued)
 (Expressed as Percent of Tissue Dry Weight \pm Standard Error)

	<i>Ilex opaca</i>	<i>Sassafras albidum</i>	<i>Amelanchier canadensis</i>	<i>Prunus serotina</i>	<i>Pyrus arbutifolia</i>	<i>Vaccinium corymbosum</i>	<i>Viburnum dentatum</i>
<i>Calcium</i>							
Fruit	0.0754	0.2055	0.1799				
Current twigs	0.5993 \pm 0.0705	0.4576 \pm 0.0276	0.8708 \pm 0.0807				
Current leaves	0.6296 \pm 0.0353	0.9776 \pm 0.0476	1.2065 \pm 0.1004				
Twigs + leaves				1.2051	1.1779	0.8043	1.1764
Branch wood + bark	0.2197 \pm 0.0346	0.2115 \pm 0.0180	0.5633 \pm 0.1124	0.2485	0.4138	0.2471	0.4686
Stem bark	1.3228 \pm 0.1457	0.4254 \pm 0.0418	2.1433 \pm 0.2328				
Stem wood	0.0617 \pm 0.0037	0.0702 \pm 0.0002	0.1702 \pm 0.0184				
Stem wood + bark				0.1731	0.1939	0.0553	0.2728
Roots	0.1594 \pm 0.0287	0.1656 \pm 0.0070	0.6296 \pm 0.1277	0.1273	0.4472	0.1006	0.1286
Dead branch wood	0.0273 \pm 0.0015	0.0149 \pm 0.0005	0.0369 \pm 0.0007				
<i>Magnesium</i>							
Fruit	0.0497	0.1321	0.0986				
Current twigs	0.1086 \pm 0.0054	0.0920 \pm 0.0070	0.1396 \pm 0.0146				
Current leaves	0.3116 \pm 0.0223	0.2482 \pm 0.0099	0.3438 \pm 0.0182				
Twigs + leaves				0.4323	0.4708	0.2353	0.2691
Branch wood + bark	0.0553 \pm 0.0031	0.0254 \pm 0.0002	0.0673 \pm 0.0092	0.0729	0.0624	0.0458	0.0625
Stem bark	0.0811 \pm 0.0044	0.0496 \pm 0.0002	0.0984 \pm 0.0037				
Stem wood	0.0439 \pm 0.0061	0.0104 \pm 0.0001	0.0248 \pm 0.0001				
Stem wood + bark				0.0467	0.0496	0.0193	0.0543
Roots	0.2459 \pm 0.0460	0.0833 \pm 0.0187	0.0941 \pm 0.0165	0.1418	0.0822	0.0379	0.0612
Dead branch wood	0.0490 \pm 0.0002	0.0245 \pm 0.0001	0.0532 \pm 0.0002				

Cation Inventory and Distribution in Tree Layer Biomass

	<i>Ilex opaca</i>		<i>Sassafras albidum</i>		<i>Amelanchier canadensis</i>		<i>Nyssa sylvatica</i>		<i>Prunus serotina</i>		<i>Pyrus arbutifolia</i>		All species	
	g/m ²	%	g/m ²	%	g/m ²	%	g/m ²	%	g/m ²	%	g/m ²	g/m ²	%	
POTASSIUM														
Fruit	0.02	(*)	*										0.02	(*)
Current twigs	0.09	(*)	0.02	(1)	0.05	(1)	0.01	(2)						
Current leaves	2.01	(8)	0.25	(17)	0.70	(19)	0.12	(21)						
Old leaves	0.67	(3)											0.67	(2)
Current twigs + leaves									0.03	(17)	*		3.28	(11)
Branch wood + bark	7.22	(29)	0.06	(4)	0.87	(24)	0.02	(4)	0.01	(6)	*		8.18	(26)
Stem bark	0.75	(3)	0.40	(27)	0.33	(9)	0.18	(32)						
Stem wood	3.07	(12)	0.08	(6)	0.36	(10)	0.04	(7)						
Stem wood + bark									0.04	(22)	0.01		5.26	(17)
Roots	11.23	(45)	0.65	(45)	1.29	(36)	0.20	(35)	0.10	(56)	0.01		13.48	(44)
Total	25.06		1.46		3.60		0.57		0.18		0.02		30.89	
SODIUM														
Fruit	*		*										*	
Current twigs	0.05	(*)	*		0.04	(1)	*							
Current leaves	0.51	(3)	0.05	(4)	0.30	(11)	0.02	(5)						
Old leaves	0.17	(1)											0.17	(1)
Current twigs + leaves									0.01	(8)			0.98	(5)
Branch wood + bark	4.04	(25)	0.01	(1)	0.92	(34)	0.01	(3)	*		*		4.98	(24)
Stem bark	0.27	(2)	0.07	(6)	0.23	(9)	0.03	(8)						
Stem wood	1.52	(9)	0.05	(4)	0.44	(16)	0.02	(5)						
Stem wood + bark									0.02	(15)	*		2.65	(13)
Roots	9.89	(60)	0.95	(84)	0.78	(29)	0.31	(79)	0.10	(77)	*		12.02	(58)
Total	16.45		1.13		2.71		0.39		0.13				20.80	

Cation Inventory and Distribution in Tree Layer Biomass (continued)

	<i>Ilex opaca</i>		<i>Sassafras albidum</i>		<i>Amelanchier canadensis</i>		<i>Nyssa sylvatica</i>		<i>Prunus serotina</i>		<i>Pyrus arbutifolia</i>		All species	
	g/m ²	%	g/m ²	%	g/m ²	%	g/m ²	%	g/m ²	%	g/m ²		g/m ²	%
CALCIUM														
Fruit	*		*								*			
Current twigs	0.13	(*)	0.01	(*)	0.14	(1)	*							
Current leaves	1.23	(5)	0.19	(11)	1.08	(7)	0.09	(13)						
Old leaves	0.41	(2)											0.41	(1)
Current twigs + leaves									0.04	(25)			2.91	(6)
Branch wood + bark	10.66	(40)	0.07	(4)	4.31	(28)	0.03	(4)	0.01	(6)	0.01		15.09	(34)
Stem bark	6.37	(24)	0.64	(38)	4.00	(26)	0.29	(41)						
Stem wood	1.72	(6)	0.35	(21)	1.59	(10)	0.16	(22)						
Stem wood + bark									0.05	(31)	0.01		15.18	(34)
Roots	6.20	(23)	0.44	(26)	4.07	(27)	0.14	(20)	0.06	(38)	0.03		10.94	(25)
Total	26.72		1.70		15.19		0.71		0.16		0.05		44.53	
MAGNESIUM														
Fruit	*		*											*
Current twigs	0.02	(*)	*		0.02	(1)	*							
Current leaves	0.61	(4)	0.05	(13)	0.31	(17)	0.02	(14)						
Old leaves	0.20	(1)											0.20	(1)
Current twigs + leaves									0.01	(11)	*		1.04	(6)
Branch wood + bark	2.68	(18)	0.01	(2)	0.51	(27)	*		*		*		3.20	(19)
Stem bark	0.39	(3)	0.07	(18)	0.18	(10)	0.03	(21)						
Stem wood	1.23	(8)	0.05	(12)	0.23	(12)	0.02	(14)						
Stem wood + bark									0.01	(11)			2.21	(13)
Roots	9.56	(65)	0.22	(55)	0.61	(33)	0.07	(50)	0.07	(78)	0.01		10.54	(61)
Total	14.69		0.40		1.86		0.14		0.09		0.01		17.19	

**Cation Inventory and Distribution in Tree Layer Production
Sunken Forest Ecosystem Analysis Plot**

	<i>Ilex opaca</i>		<i>Sassafras albidum</i>		<i>Amelanchier canadensis</i>		<i>Nyssa sylvatica</i>	<i>Prunus serotina</i>	<i>Pyrus arbutifolia</i>	All Species	
	g/m ²	%	g/m ²	%	g/m ²	%	g/m ²	g/m ²	g/m ²	g/m ²	(%)
POTASSIUM											
Fruit	0.016	(1)	0.003	(1)						0.019	(*)
Current twigs	0.094	(3)	0.018	(6)	0.045	(5)	0.008				
Current leaves	2.012	(69)	0.254	(83)	0.700	(74)	0.123				
Current twigs + leaves								0.030	0.004	3.288	(75)
Branch wood + bark	0.260	(4)	0.008	(3)	0.096	(10)	0.004	0.001	*	0.369	(8)
Stem bark	0.009	(*)	0.005	(2)	0.006	(1)	0.002				
Stem wood	0.137	(5)	0.001	(*)	0.012	(1)	0.001				
Stem wood + bark								0.001	*	0.174	(4)
Roots	0.389	(13)	0.018	(6)	0.089	(9)	0.006	0.008	*	0.510	(12)
Total	2.917		0.307		0.948		0.144	0.040	0.004	4.360	
SODIUM											
Fruit	0.002	(*)	*							0.002	(*)
Current twigs	0.053	(5)	0.004	(5)	0.042	(8)	0.002				
Current leaves	0.507	(45)	0.049	(59)	0.300	(58)	0.024				
Current twigs + leaves								0.005	*	0.986	(56)
Branch wood + bark	0.145	(13)	0.002	(2)	0.102	(20)	0.001	*	*	0.250	(14)
Stem bark	0.003	(*)	0.001	(1)	0.004	(1)	*				
Stem wood	0.068	(6)	0.001	(1)	0.015	(3)	*				
Stem wood + bark								*	*	0.092	(5)
Roots	0.343	(31)	0.026	(31)	0.053	(10)	0.008	0.008	*	0.438	(25)
Total	21.121		0.083		0.516		0.035	0.013	*	1.768	

Cation Inventory and Distribution in Tree Layer Production
Sunken Forest Ecosystem Analysis Plots (continued)

	<i>Ilex opaca</i>		<i>Sassafras albidum</i>		<i>Amelanchier canadensis</i>		<i>Nyssa sylvatica</i>	<i>Prunus serotina</i>	<i>Pyrus arbutifolia</i>	All Species	
	g/m ²	%	g/m ²	%	g/m ²	%	g/m ²	g/m ²	g/m ²	g/m ²	%
CALCIUM											
Fruit	0.002	(*)	*							0.002	(*)
Current twigs	0.131	(6)	0.008	(3)	0.143	(7)	0.004				
Current leaves	1.233	(58)	0.188	(80)	1.083	(51)	0.091				
Current twigs + leaves								0.036	0.004	2.921	(63)
Branch wood + bark	0.384	(18)	0.011	(5)	0.476	(23)	0.005	0.001	*	0.877	(19)
Stem bark	0.077	(4)	0.009	(4)	0.075	(4)	0.004				
Stem wood	0.077	(4)	0.006	(3)	0.055	(3)	0.003				
Stem wood + bark								0.001	*	0.307	(6)
Roots	0.215	(10)	0.012	(5)	0.280	(13)	0.004	0.005	*	0.516	(11)
Total	2.119		0.234		2.112		0.111	0.043	0.004	4.623	
MAGNESIUM											
Fruit	0.002	(*)	*							0.002	(*)
Current twigs	0.024	(2)	0.002	(3)	0.023	(5)	0.001				
Current leaves	0.610	(54)	0.047	(81)	0.309	(70)	0.023				
Current twigs + leaves								0.013	0.001	1.053	(63)
Branch wood + bark	0.097	(9)	0.001	(2)	0.057	(13)	0.001	*	*	0.156	(9)
Stem bark	0.004	(*)	0.001	(2)	0.003	(1)	*				
Stem wood	0.055	(5)	0.001	(2)	0.008	(2)					
Stem wood + bark								*	*	0.072	(4)
Roots	0.331	(29)	0.006	(10)	0.041	(9)	0.002	0.006	*	0.386	(23)
Total	1.123		0.058		0.441		0.027	0.019	0.001	1.669	

**Cation Inventory and Distribution in Shrub Layer Biomass
Sunken Forest Ecosystem Analysis Plot**

	<i>Amelanchier canadensis</i>		<i>Ilex opaca</i>		<i>Vaccinium corymbosum</i>		<i>Prunus serotina</i>	
	g/m ²	%	g/m ²	%	g/m ²	%	g/m ²	%
POTASSIUM								
Current twigs + leaves	0.026	(27)	0.007	(16)	0.004	(31)	0.019	(56)
Branch wood + bark	0.013	(14)	0.004	(9)	0.003	(23)	0.003	(9)
Stem wood + bark	0.013	(14)	0.005	(11)	0.005	(38)	0.003	(9)
Roots	0.043	(45)	0.028	(64)	0.001	(8)	0.009	(27)
Total	0.095		0.044		0.013		0.034	
SODIUM								
Current twigs + leaves	0.012	(19)	0.002	(6)	0.003	(43)	0.003	(21)
Branch wood + bark	0.014	(22)	0.002	(6)	0.003	(43)	0.001	(7)
Stem wood + bark	0.012	(19)	0.002	(6)	0.001	(14)	0.001	(7)
Roots	0.026	(41)	0.025	(81)	*		0.009	(64)
Total	0.064		0.031		0.007		0.014	
CALCIUM								
Current twigs + leaves	0.043	(12)	0.004	(11)	0.012	(52)	0.023	(64)
Branch wood + bark	0.066	(19)	0.006	(17)	0.007	(30)	0.003	(8)
Stem wood + bark	0.105	(30)	0.010	(28)	0.003	(13)	0.004	(11)
Roots	0.136	(39)	0.016	(44)	0.001	(4)	0.006	(17)
Total	0.350		0.036		0.023		0.036	
MAGNESIUM								
Current twigs + leaves	0.012	(25)	0.002	(7)	0.004	(67)	0.008	(50)
Branch wood + bark	0.008	(17)	0.001	(3)	0.001	(17)	0.001	(6)
Stem wood + bark	0.007	(15)	0.002	(7)	0.001	(17)	0.001	(6)
Roots	0.020	(43)	0.024	(83)	*		0.006	(38)
Total	0.047		0.029		0.06		0.016	

Cation Inventory and Distribution in Shrub Layer Biomass
Sunken Forest Ecosystem Analysis Plot (continued)

	<i>Viburnum dentatum</i>		<i>Pyrus arbutifolia</i>		<i>Sassafras albidum</i>		All Species	
	g/m ²	%	g/m ²	%	g/m ²	%	g/m ²	%
POTASSIUM								
Current twigs + leaves	0.017	(61)	0.004	(33)	0.008	(73)	0.085	(36)
Branch wood + bark	0.004	(14)	*		*		0.027	(11)
Stem wood + bark	0.006	(21)	0.006	(50)	0.001	(9)	0.039	(17)
Roots	0.001	(4)	0.002	(17)	0.002	(18)	0.086	(36)
Total	0.028		0.012		0.011		0.237	
SODIUM								
Current twigs + leaves	0.001	(33)	*		0.001	(3)	0.022	(15)
Branch wood + bark	*		*		*		0.020	(13)
Stem wood + bark	0.001	(33)	0.001	(50)	*		0.018	(12)
Roots	0.001	(33)	0.001	(50)	0.029	(97)	0.091	(60)
Total	0.003		0.002		0.030		0.151	
CALCIUM								
Current twigs + leaves	0.018	(60)	0.004	(27)	0.005	(25)	0.109	(21)
Branch wood + bark	0.004	(13)	*		0.001	(5)	0.087	(17)
Stem wood + bark	0.007	(23)	0.006	(40)	0.001	(5)	0.137	(27)
Roots	0.001	(3)	0.005	(33)	0.013	(65)	0.178	(35)
Total	0.030		0.015		0.020		0.511	
MAGNESIUM								
Current twigs + leaves	0.004	(40)	0.001	(25)	0.001	(50)	0.032	(28)
Branch wood + bark	*		*		*		0.011	(10)
Stem wood + bark	0.001	(10)	0.002	(50)	*		0.014	(12)
Roots	0.005	(50)	0.001	(25)	0.001	(50)	0.057	(50)
Total	0.010		0.004		0.002		0.114	

Cation Concentrations in Herbaceous Layer Plant Tissues
(Expressed as percent of tissue dry weight)

	K	Na	Ca	Mg
SHOOTS				
<i>Aralia nudicaulis</i>	1.6187	0.1618	0.8739	0.4121
<i>Celastrus scandens</i>	1.9545	0.2078	0.3854	0.2656
<i>Dryopteris spinulosa</i>	1.6481	0.2217	0.2973	0.4889
<i>Maianthemum canadense</i>	2.5171	0.1743	0.7969	0.3471
<i>Parthenocissus quinquefolia</i>	1.1537	0.1839	1.0443	0.3033
<i>Pteridium aquilinum</i>	2.4477	0.1181	0.1882	0.1917
<i>Pyrus arbutifolia</i>	1.5055	0.2238	0.9211	0.3169
<i>Rhus radicans</i>	0.6651	0.1295	0.5906	0.2630
<i>Smilacina stellata</i>	2.7916	0.1410	0.7128	0.2841
ROOTS				
<i>Aralia nudicaulis</i>	0.5954	0.1686	1.3961	0.2952
<i>Celastrus scandens</i>	0.7623	0.1818	0.3735	0.2744
<i>Dryopteris spinulosa</i>	0.2768	0.0830	0.5864	0.3528
<i>Maianthemum canadense</i>	0.8621	0.1529	0.1464	0.1195
<i>Parthenocissus quinquefolia</i>	0.5083	0.1415	1.1563	0.2292
<i>Pteridium aquilinum</i>	0.2890	0.0504	0.0881	0.1616
<i>Pyrus arbutifolia</i>	0.4251	0.0985	0.2686	0.1035
<i>Rhus radicans</i>	0.2612	0.0628	0.7080	0.1745
<i>Smilacina stellata</i>	0.9269	0.1378	0.1140	0.0738
WHOLE PLANTS				
<i>Amelanchier canadensis</i>	0.7612	0.0951	0.4307	0.0986
<i>Geranium robertianum</i>	1.9230	0.4790	2.2874	0.4385
<i>Ilex opaca</i>	1.1086	0.5448	0.4062	0.5102
<i>Prunus serotina</i>	0.6885	0.1407	0.4252	0.2126
<i>Sassafras albidum</i>	1.4607	0.1209	0.0527	0.1290
<i>Trientalis borealis</i>	1.2108	0.2522	0.6329	0.3394
<i>Viburnum dentatum</i>	1.5600	0.0421	0.9872	0.1778
<i>Smilax rotundifolia</i> stems	0.9165	0.0502	0.1773	0.0645
<i>Smilax rotundifolia</i> leaves	0.8532	0.1129	0.1621	0.2760

Sunken Forest Soil Analysis
(mean \pm S.E.)

	0-15 cm layer	15-30 cm layer
Physical properties		
Texture (International System, with organic matter)		
Sand (%)	93.3 \pm 0.3	95.4 \pm 0.3
Silt (%)	3.0 \pm 0.4	0.6 \pm 0.1
Clay (%)	3.7 \pm 0.2	4.0 \pm 0.2
Bulk density (g/cm ³)	0.71 \pm 0.09	1.46 \pm 0.15
Loss on ignition (%)	7.1 \pm 0.7	0.38 \pm 0.07
Soil Weight (kg/1.525 \times 10⁵cm³)		
Organic matter	7.7	0.8
Soil minerals	100.5	221.7
TOTAL	108.2	222.5
Chemical properties		
pH	4.16 \pm 0.09	4.10 \pm 0.04
Cation exchange capacity (me/100 g soil)	10.2 \pm 1.5	0.7 \pm 0.1
Cation exchange capacity of organic free samples) (me/100 g soil)	0.15 \pm 0.01	0.15 \pm 0.01
Exchangeable cations (mg/1000 kg soil)		
K	59 \pm 9	2.3 \pm 0.3
Na	54 \pm 6	3.9 \pm 0.3
Ca	255 \pm 55	4.8 \pm 0.9
Mg	86 \pm 13	1.8 \pm 0.3
Soil minerals (metal % of mineral weight)		
K	0.143 \pm 0.007	0.144 \pm 0.005
Na	0.134 \pm 0.004	0.149 \pm 0.004
Ca	0.189 \pm 0.013	0.198 \pm 0.010
Mg	0.087 \pm 0.002	0.090 \pm 0.007