Calibration Report: Low N Sedimentary Site Base Case

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Soil Solution Results

Table 1: Average Soil Solution Concentrations of Reliable Months (2005-2006)

	$\\mu$mol/L															
Soil Layer	Ca	Mg	K	Na	NO3	NH4	SO4	Cl	PO4	DOC	Al	Si	H+	pH	R	HR
Layer 1	12.64	16.8	16.5	44.8	1.434	0.704	24.8	55.2	1.025	336	0.01905	15.0	19.63	4.71	34.2	13.8
Layer 2	15.80	21.6	18.8	53.9	1.069	0.408	25.4	63.0	0.894	582	0.02883	32.6	24.36	4.61	57.5	25.7
Layer 3	22.36	26.4	22.0	48.8	0.658	0.237	25.4	69.1	0.726	651	0.01796	45.0	18.79	4.73	66.6	26.4
Layer 4	8.98	15.6	14.4	46.9	0.416	0.438	12.7	65.6	0.399	400	0.02309	53.6	20.38	4.69	39.9	17.2
Layer 5	12.60	20.8	14.8	50.1	0.407	1.049	12.7	71.1	0.185	404	0.00611	55.6	8.96	5.05	44.7	13.1
Layer 6	11.80	18.8	16.8	52.7	0.422	1.308	12.7	76.5	0.229	370	0.00754	59.4	10.53	4.98	40.3	12.5
Layer 7	15.05	20.6	15.7	59.3	0.459	1.981	12.7	82.6	0.301	416	0.00463	63.9	7.21	5.14	47.0	12.4
Layer 8	14.79	19.0	18.0	66.9	0.485	2.424	12.6	87.0	0.226	414	0.00354	66.3	5.80	5.24	47.9	11.3

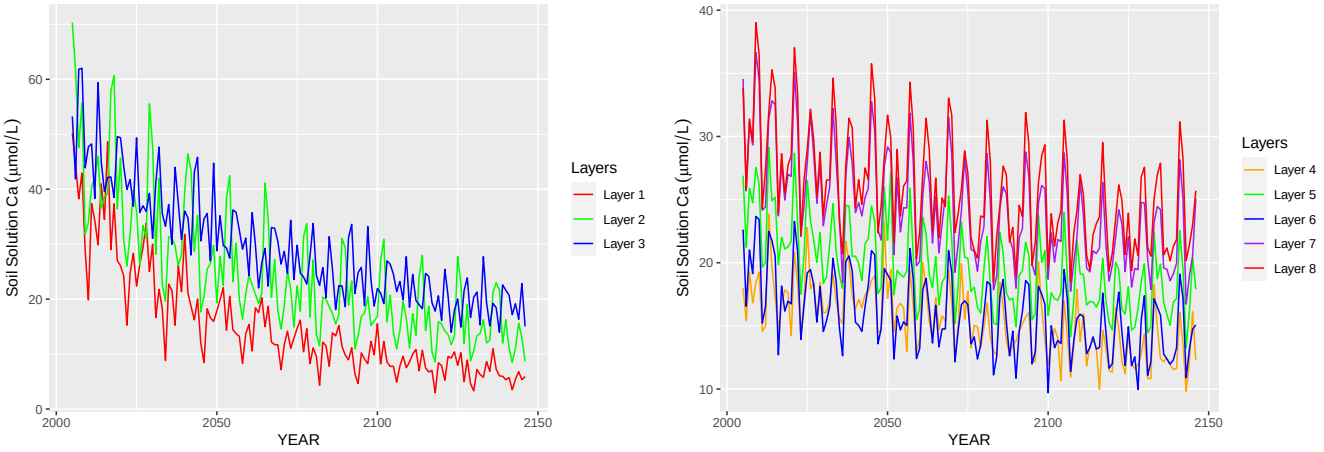


Figure 1: Monthly Calcium Concentrations by Soil Layer

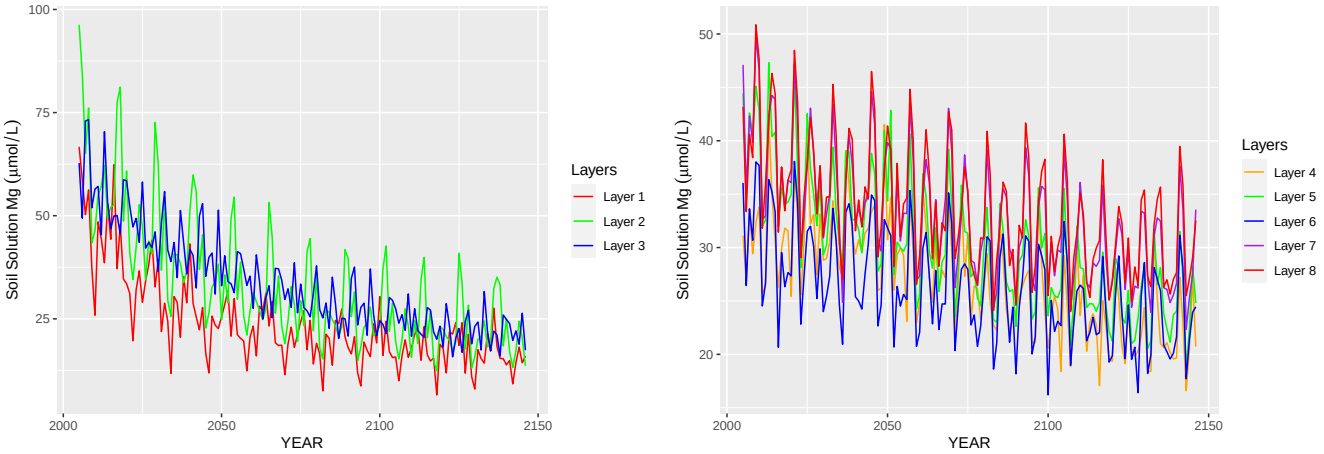


Figure 2: Monthly Magnesium Concentrations by Soil Layer

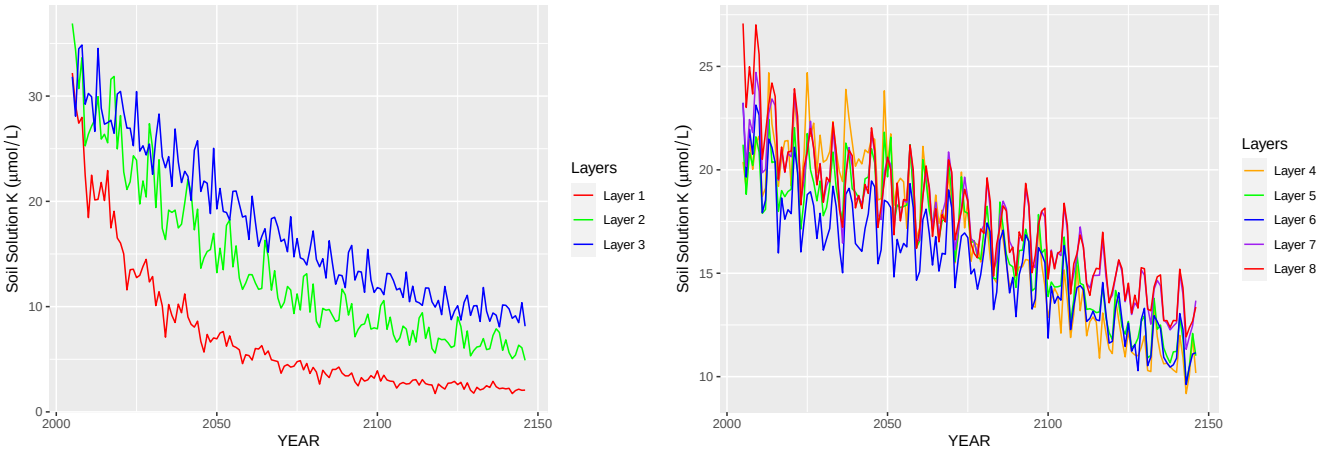


Figure 3: Monthly Potassium Concentrations by Soil Layer

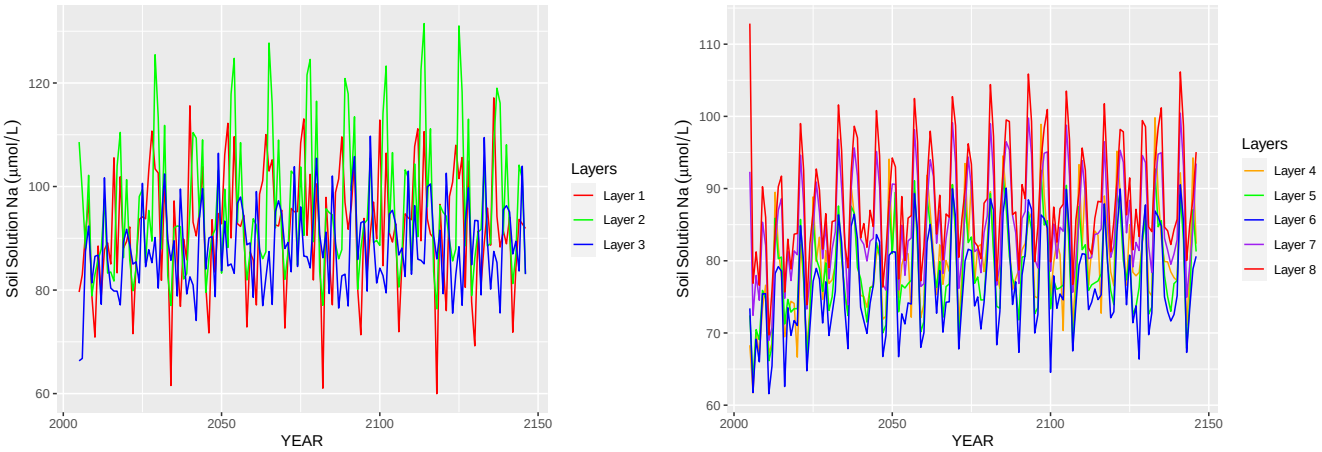


Figure 4: Monthly Sodium Concentrations by Soil Layer

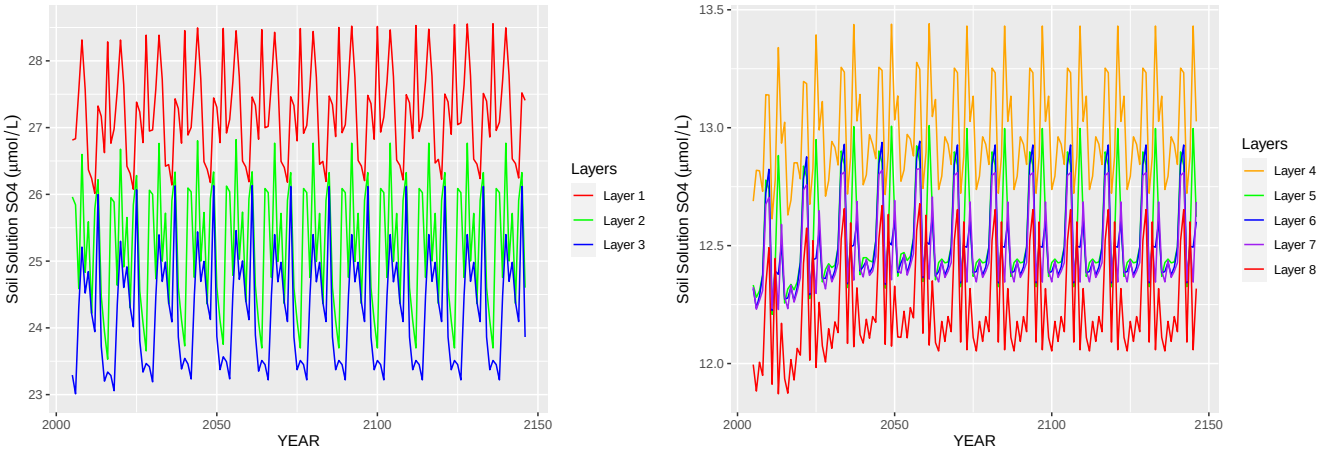


Figure 5: Monthly Sulfate Concentrations by Soil Layer

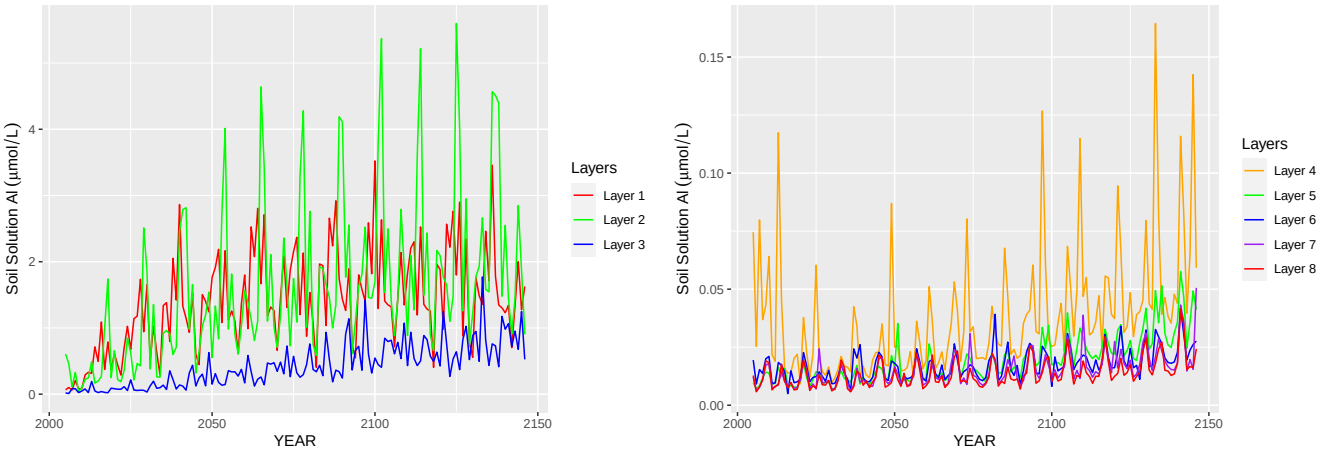


Figure 6: Monthly Aluminum Concentrations by Soil Layer

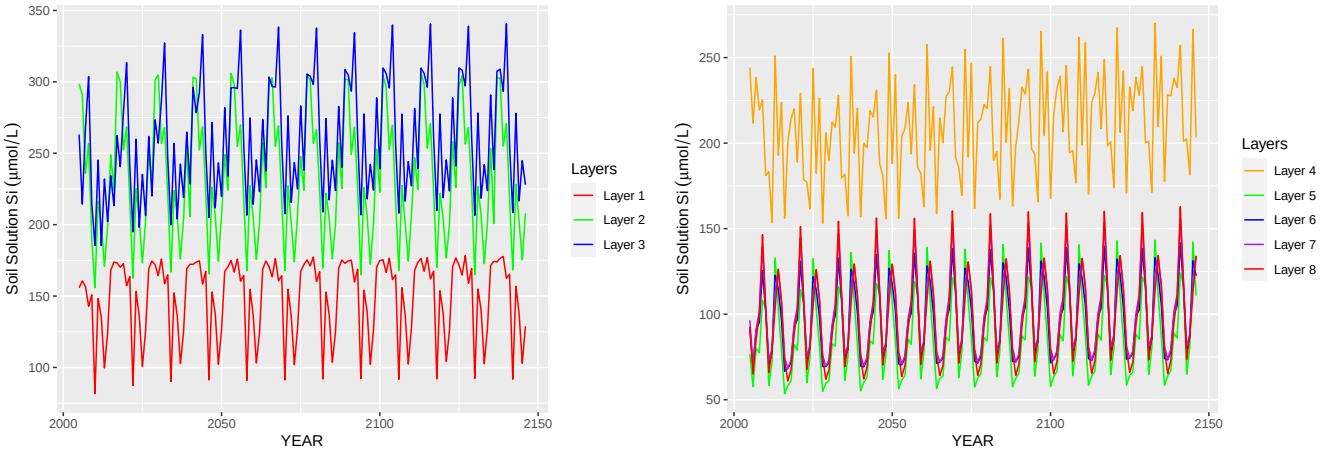


Figure 7: Monthly SiO2 Concentrations by Soil Layer

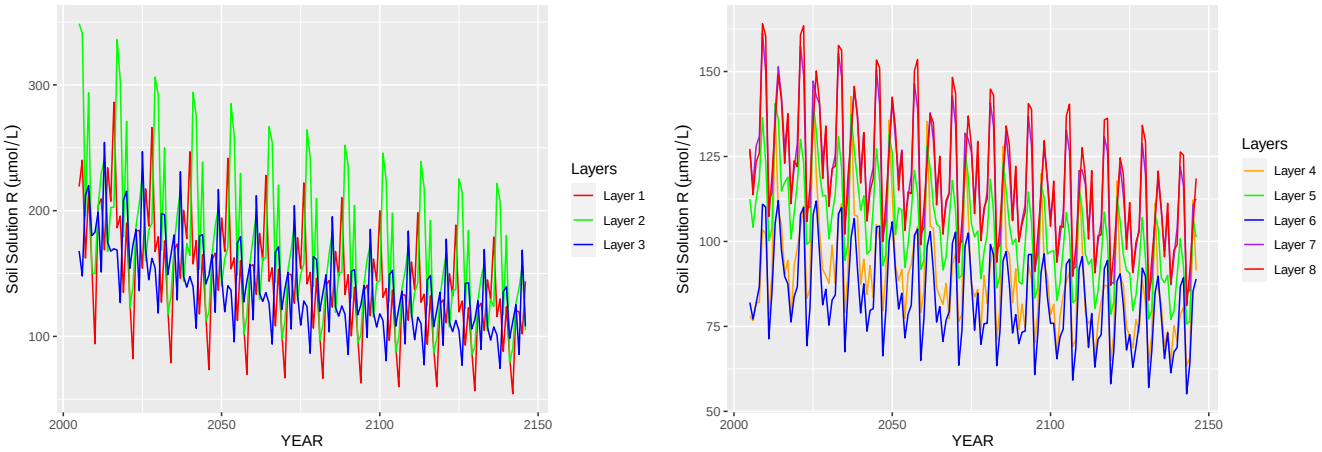


Figure 8: Monthly Organic Acid Base (R-) Concentrations by Soil Layer

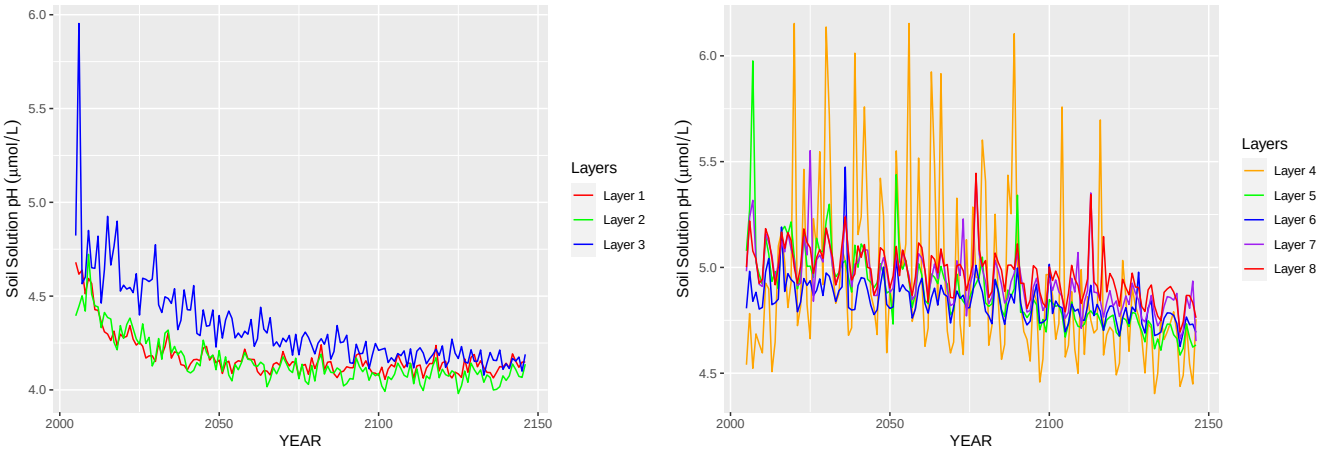


Figure 9: Monthly pH by Soil Layer

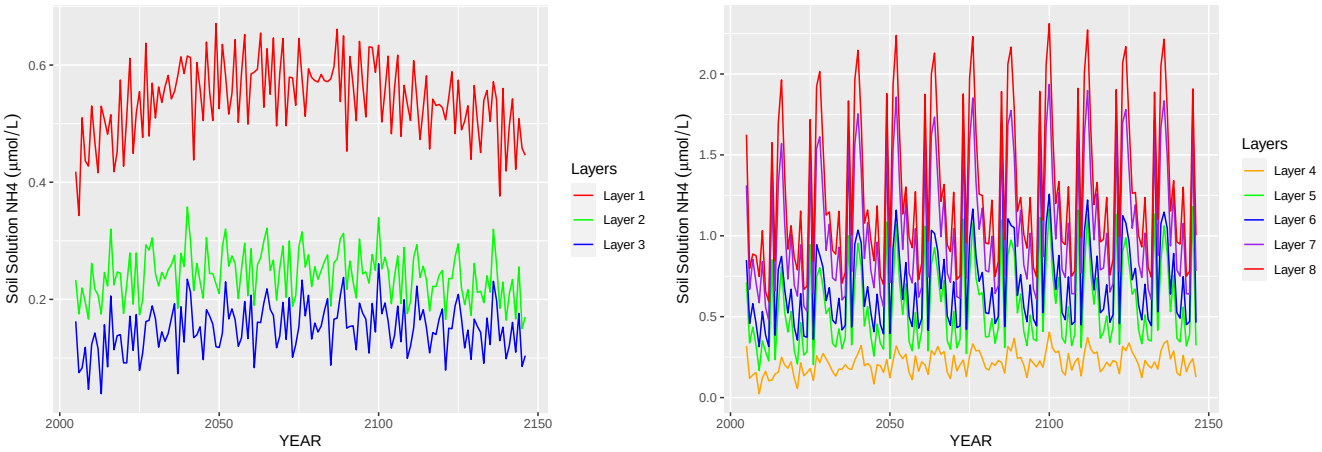


Figure 10: Yearly Ammonium concentration by Soil Layer

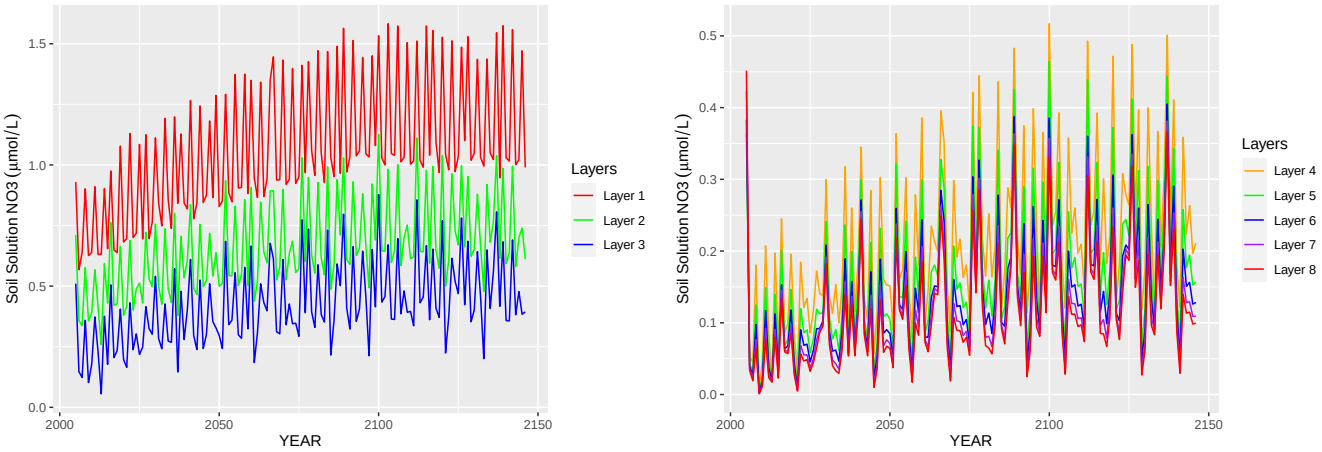


Figure 11: Yearly Nitrate concentration by Soil Layer

Weathering Results

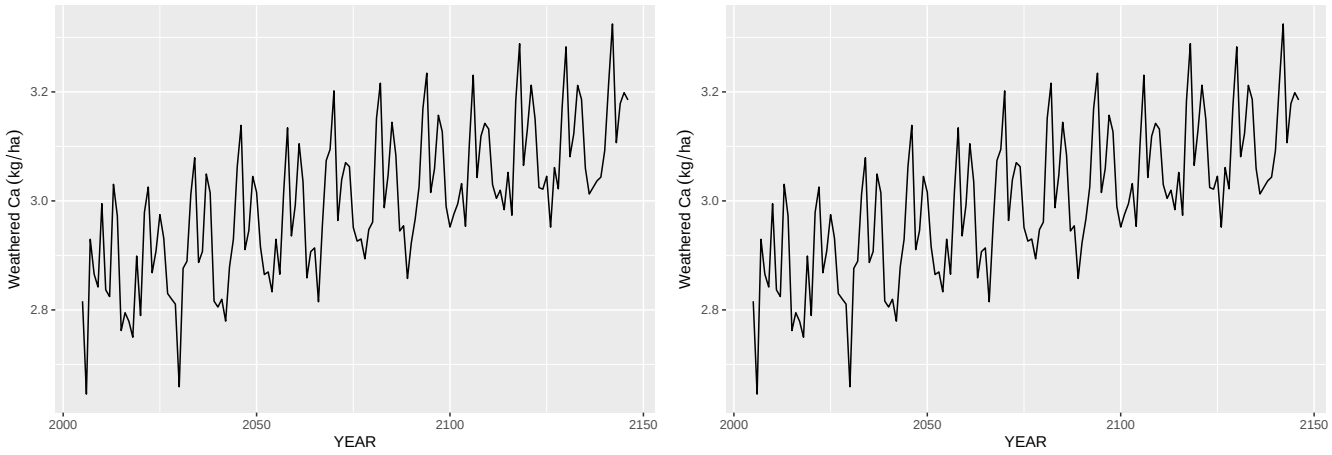


Figure 12: Calcium Weathering (All Layer)

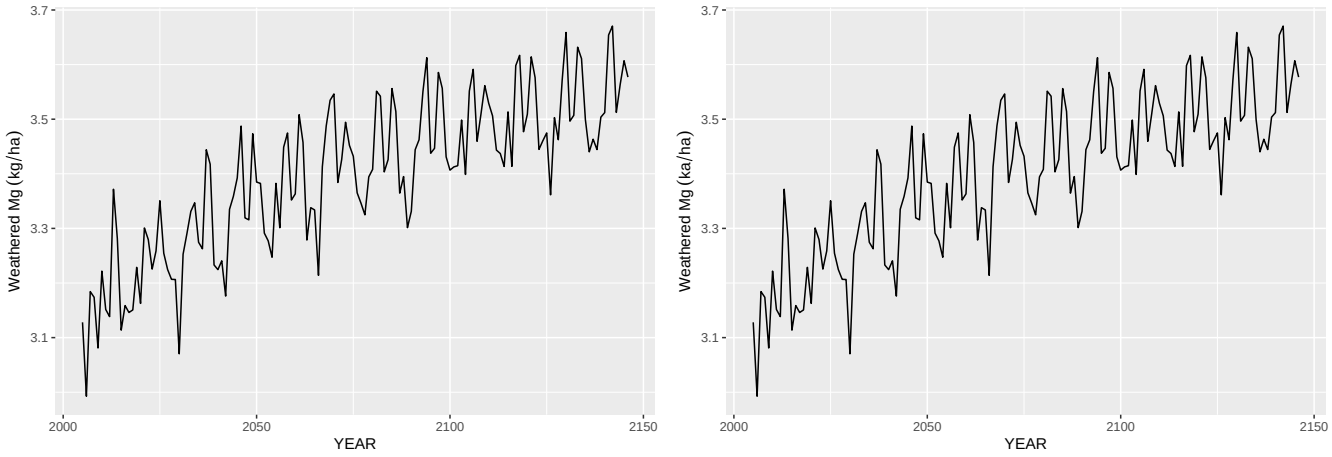


Figure 13: Magnesium Weathering (All Layer)

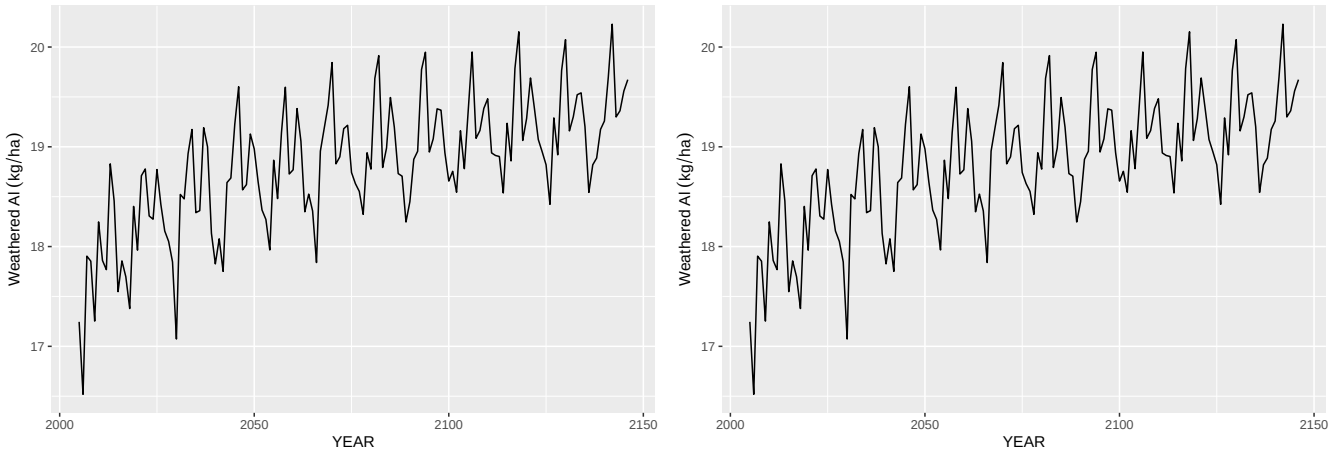


Figure 14: Aluminum Weathering (All Layer)

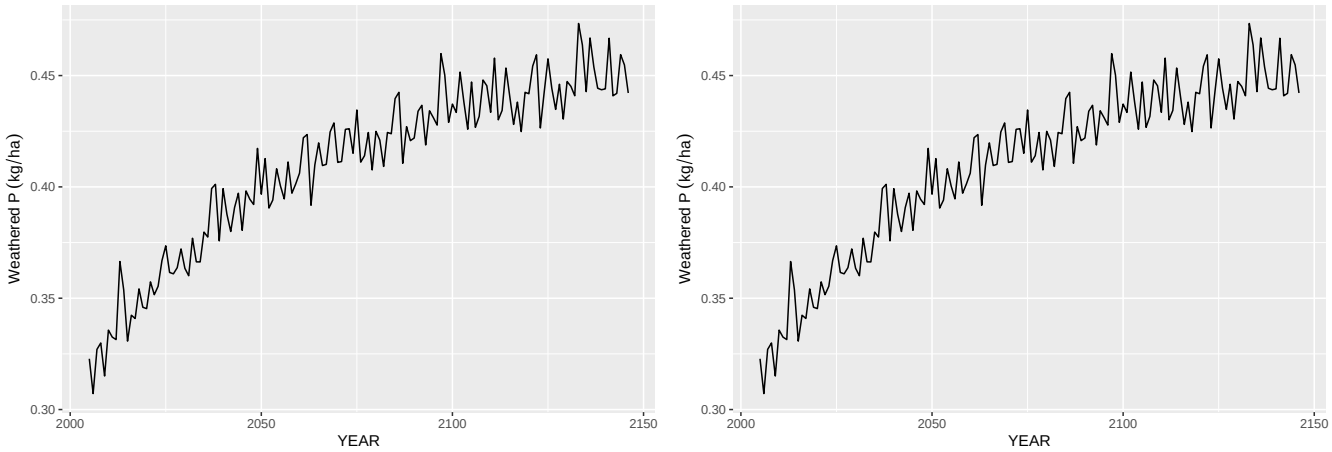


Figure 15: Phosphate Weathering (All Layer)

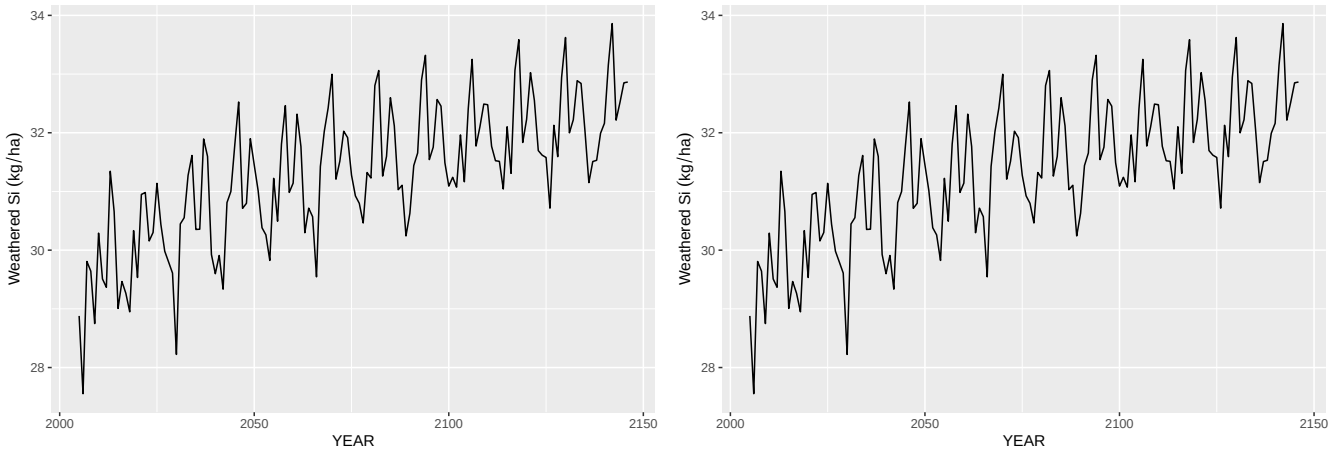


Figure 16: Silica Weathering (All Layer)

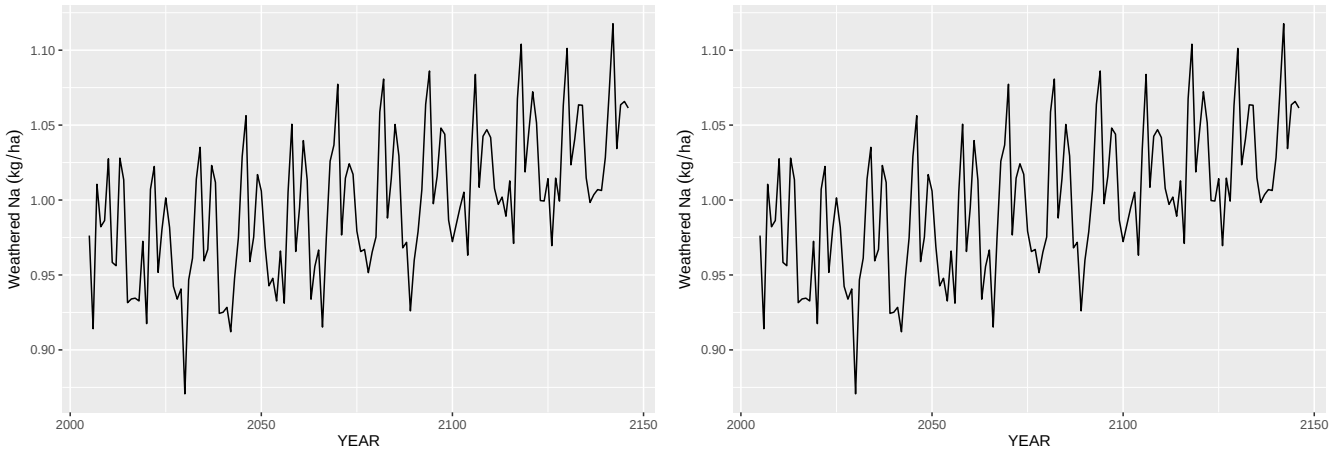


Figure 17: Sodium Weathering (All Layer)

Litter Pool Results

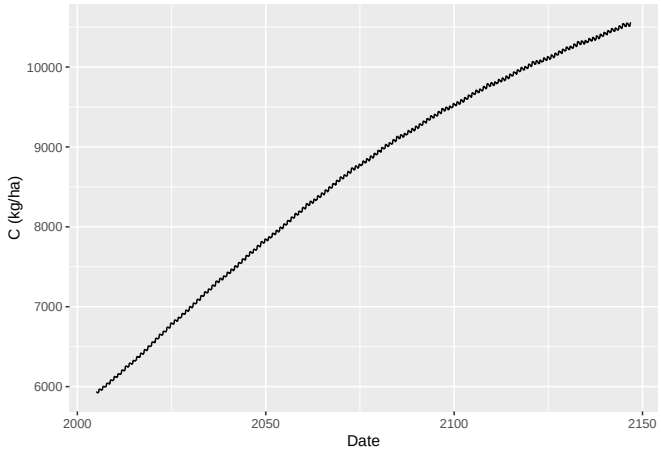
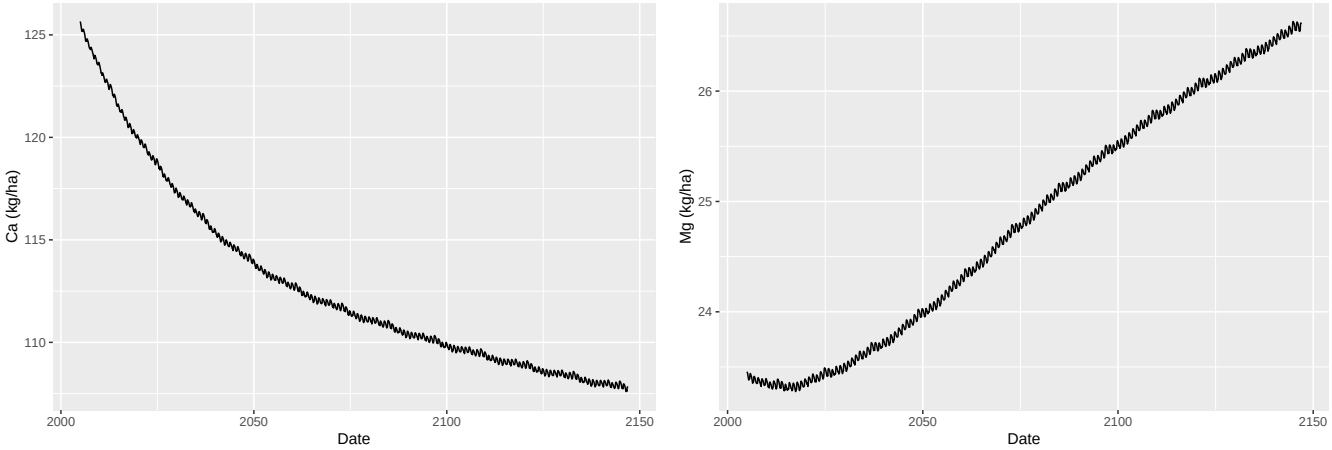


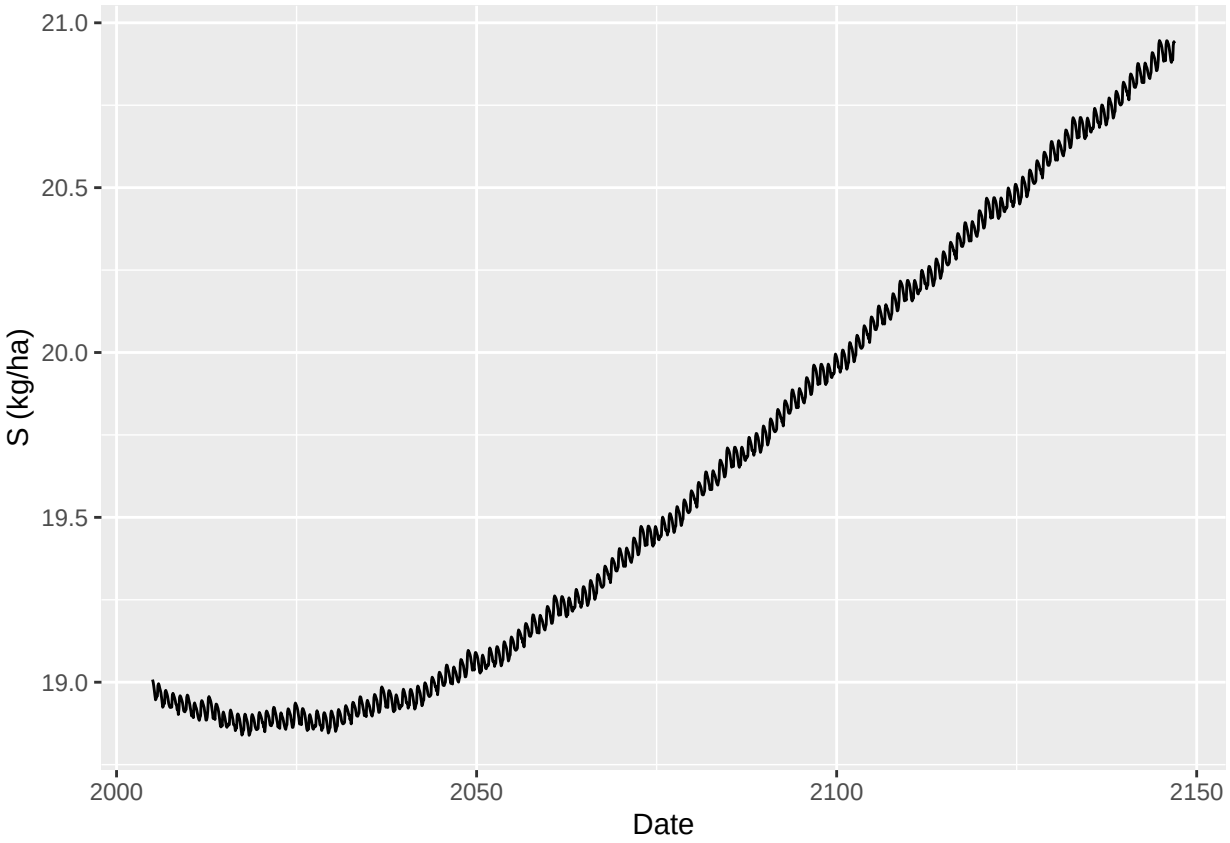
Figure 18: Litter Pool Carbon Content Over Simulation Period

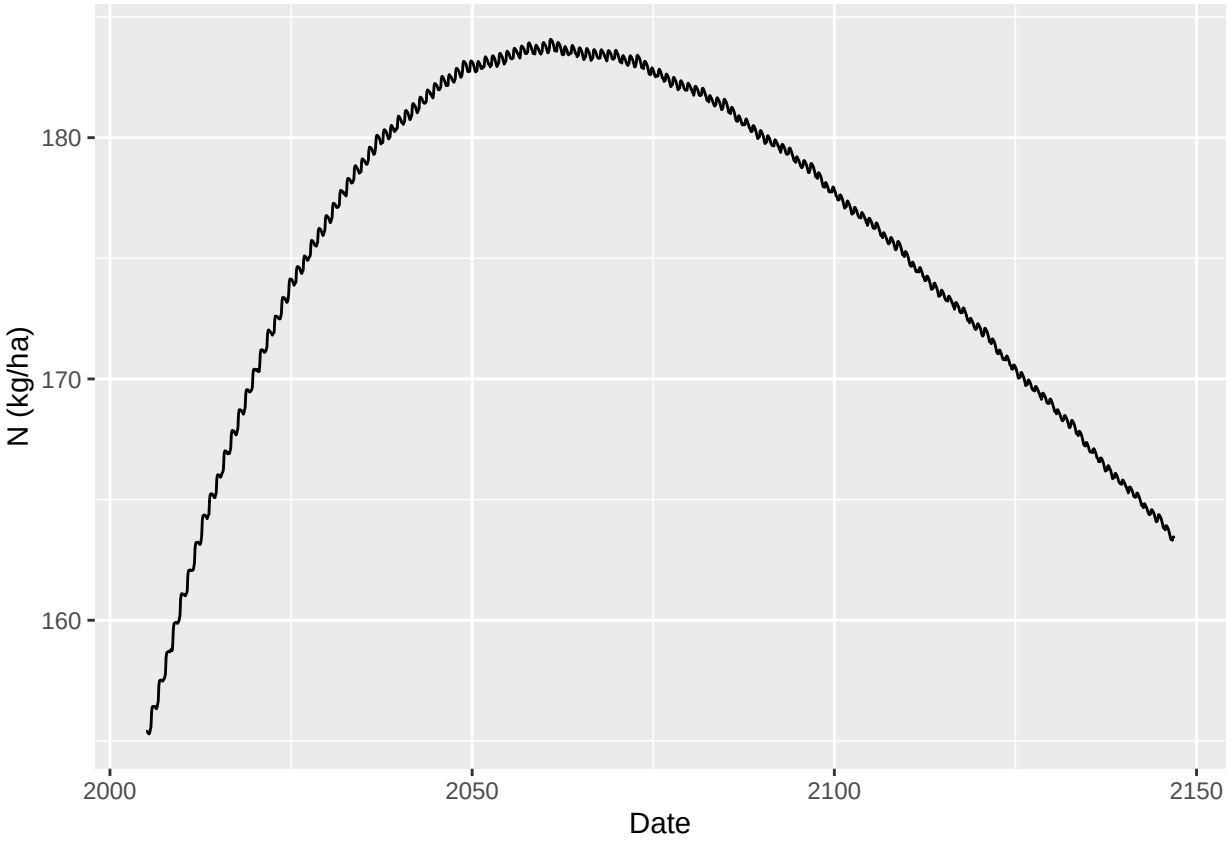


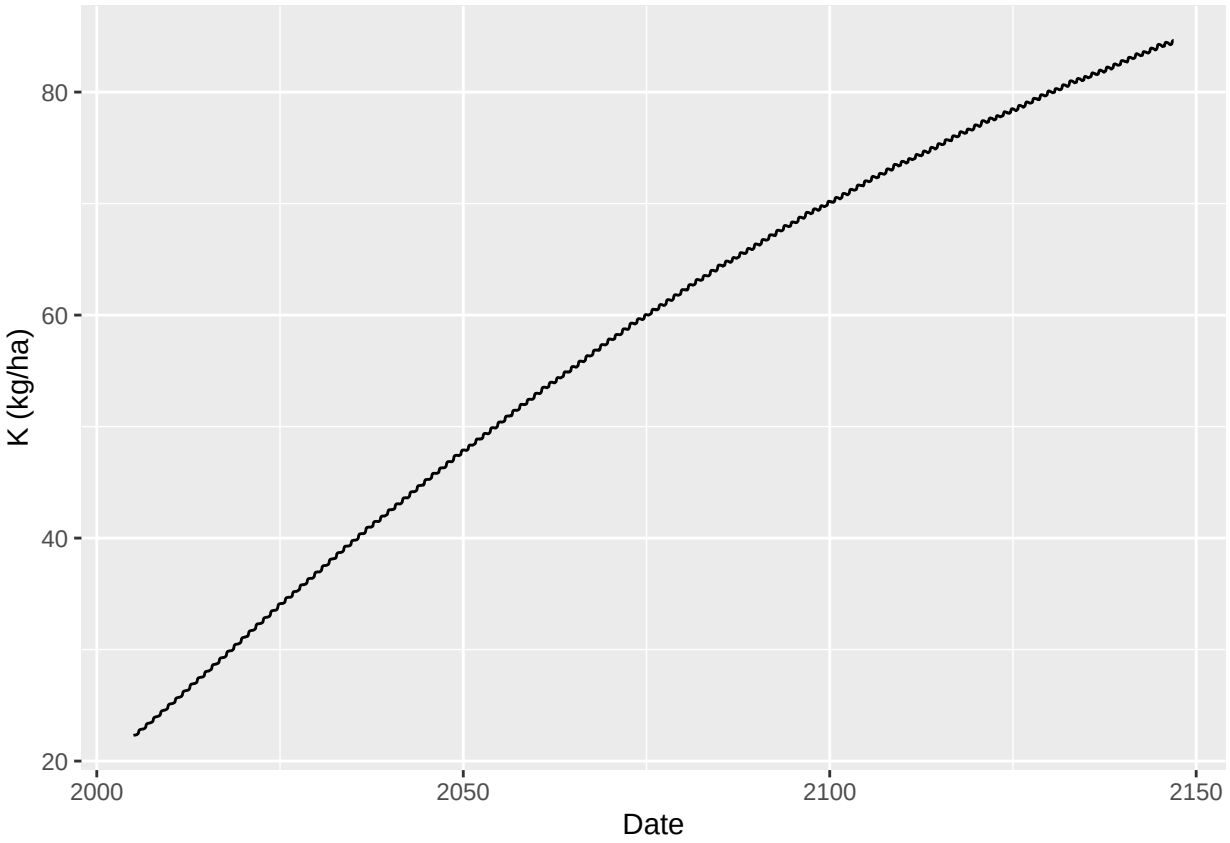
(a) Litter Calcium Content

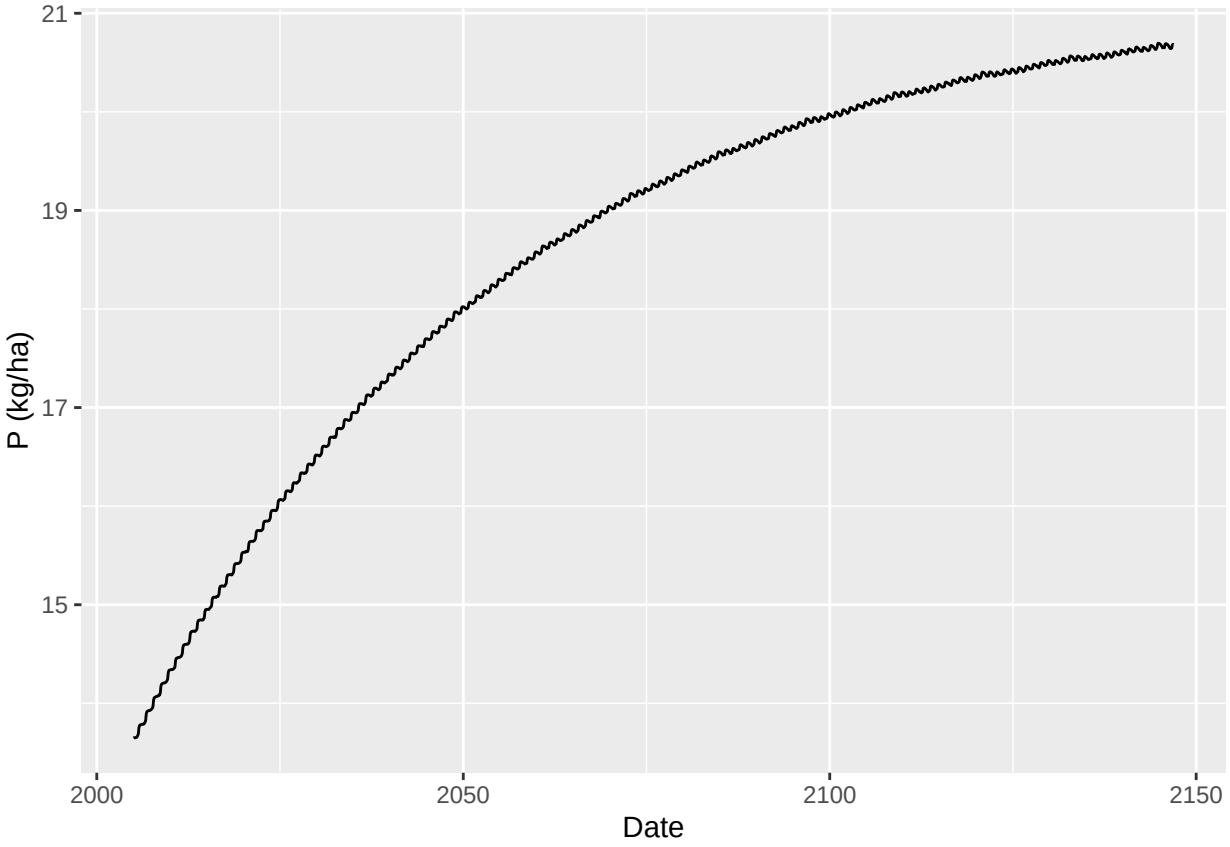
(b) Litter Magnesium Content

Figure 19: Litter Pool Nutrient Content Over Simulation Period

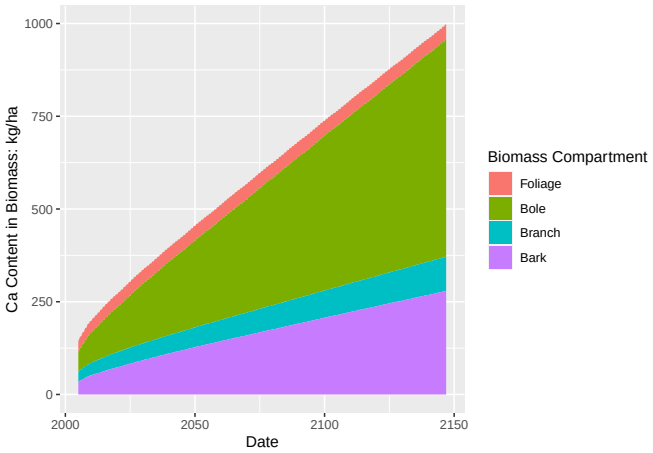

21.0
20.5
20.0
19.5
19.0
S (kg/ha)
2000
2050
2100
2150
Date


180
170
160
N (kg/ha)
2000
2050
2100
2150
Date

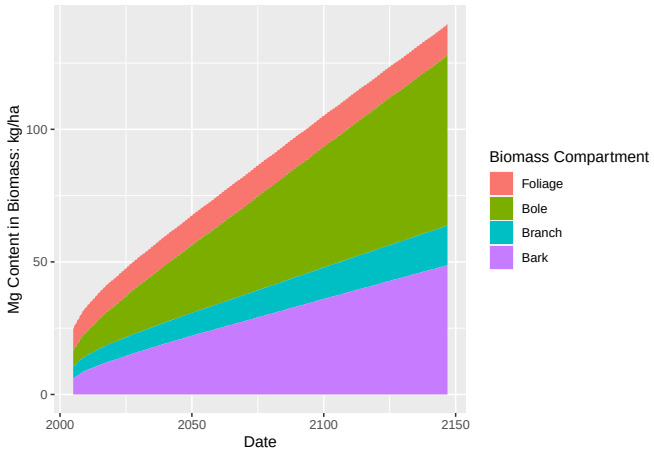

80
60
40
20
K (kg/ha)
2000
2050
2100
2150
Date


21
19
17
15
P (kg/ha)
2000
2050
2100
2150
Date

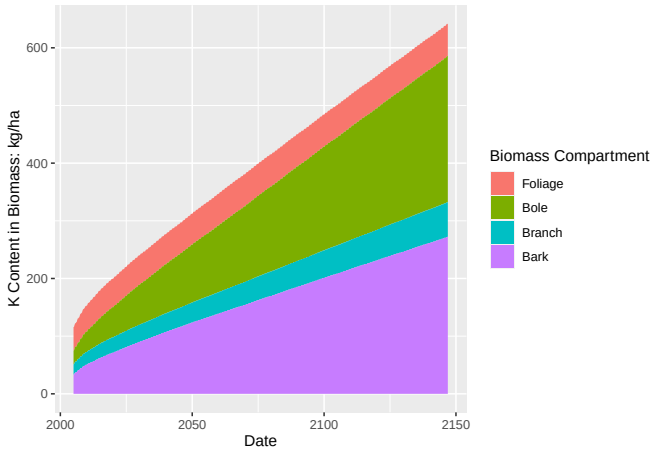
Tree Nutrient Content



(a) Calcium content in each biomass compartment

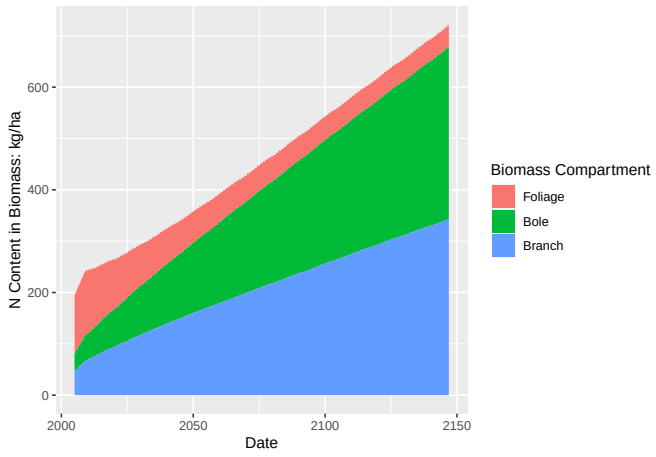


(b) Magnesium content in each biomass compartment

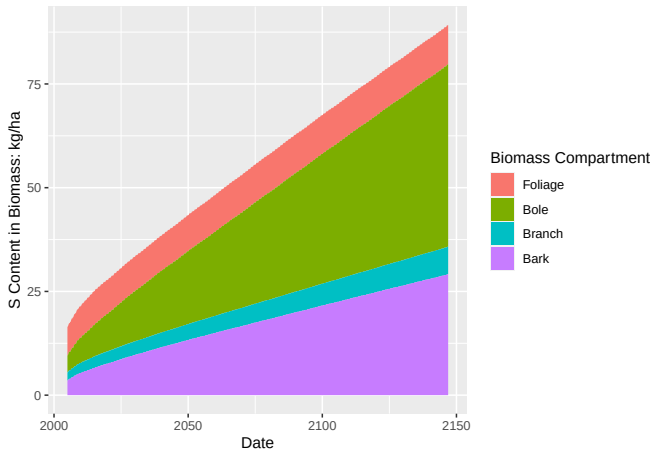


(c) Potassium content in each biomass compartment

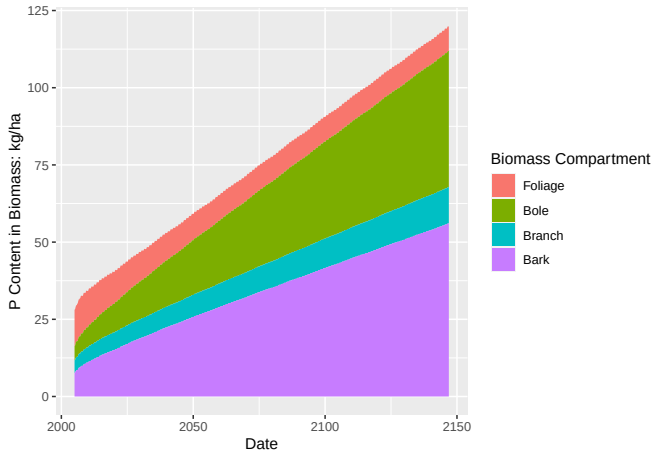
Figure 20: Base Cation Nutrient Content in Simulated Forest



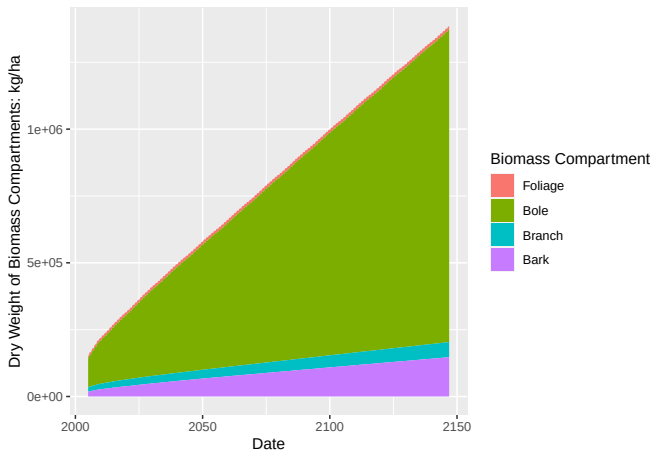
(a) Nitrogen content in each biomass compartment



(b) Sulfur content in each biomass compartment



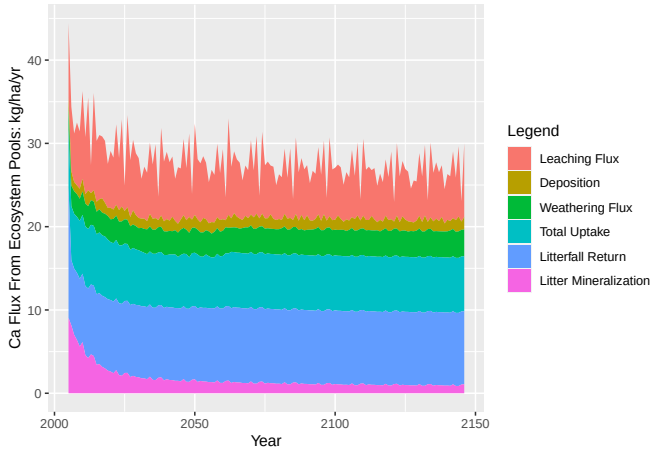
(c) Phosphorous content in each biomass compartment



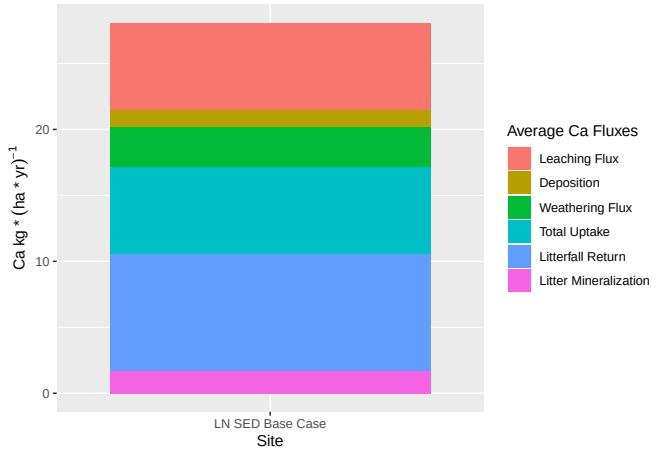
(d) Biomass of each compartment

Figure 21: N, S, and P Nutrient Contents and biomass per compartment

Analysis 1: Stack Flux Data

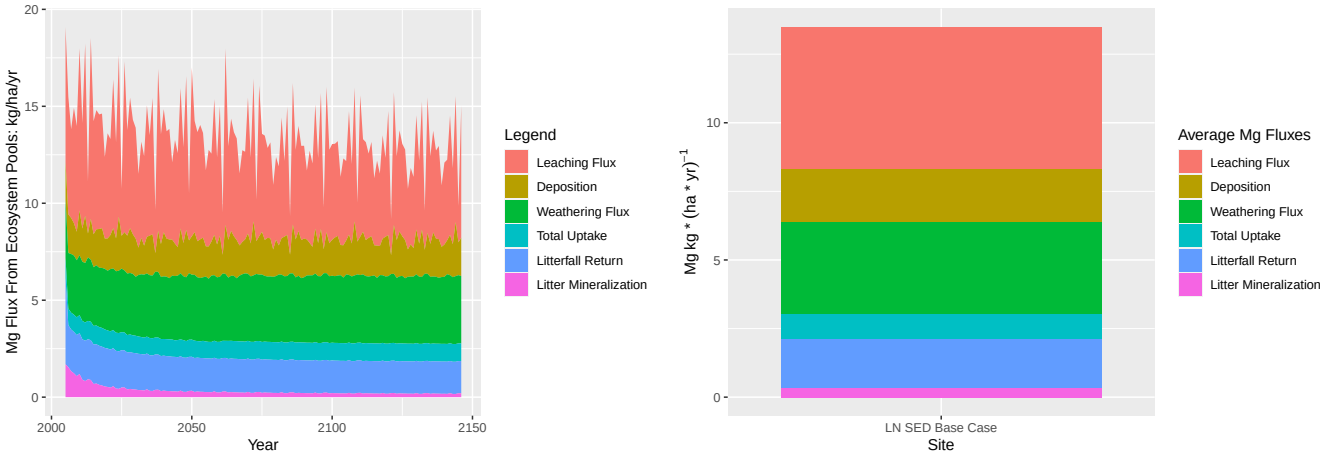


(a) Ca input and output fluxes over time



(b) Total Average Ca input and output fluxes

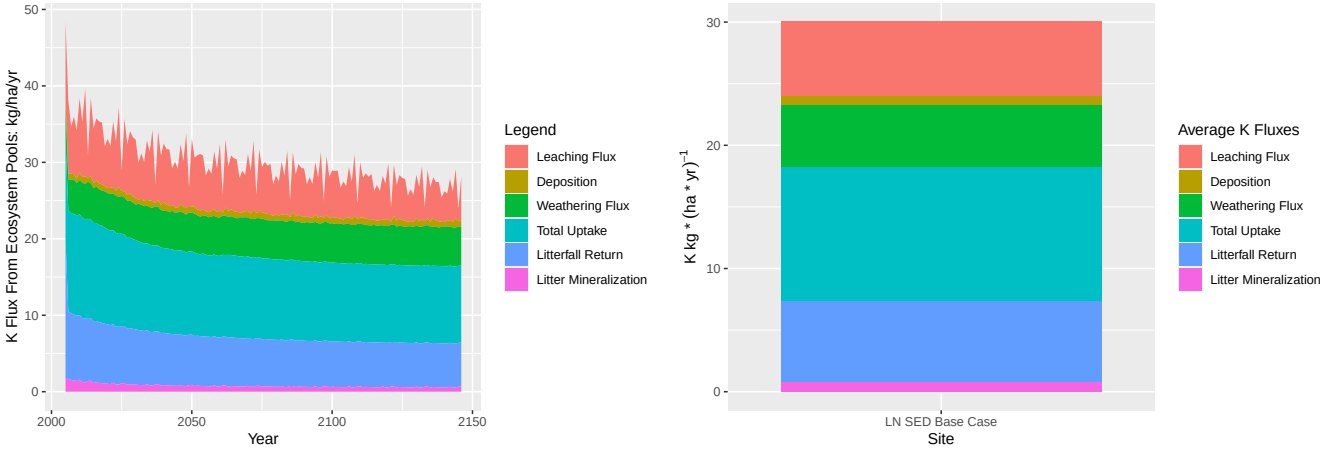
Figure 22: Calcium input and output comparison graphs



(a) Mg input and output fluxes over time

(b) Total Average Mg input and output fluxes

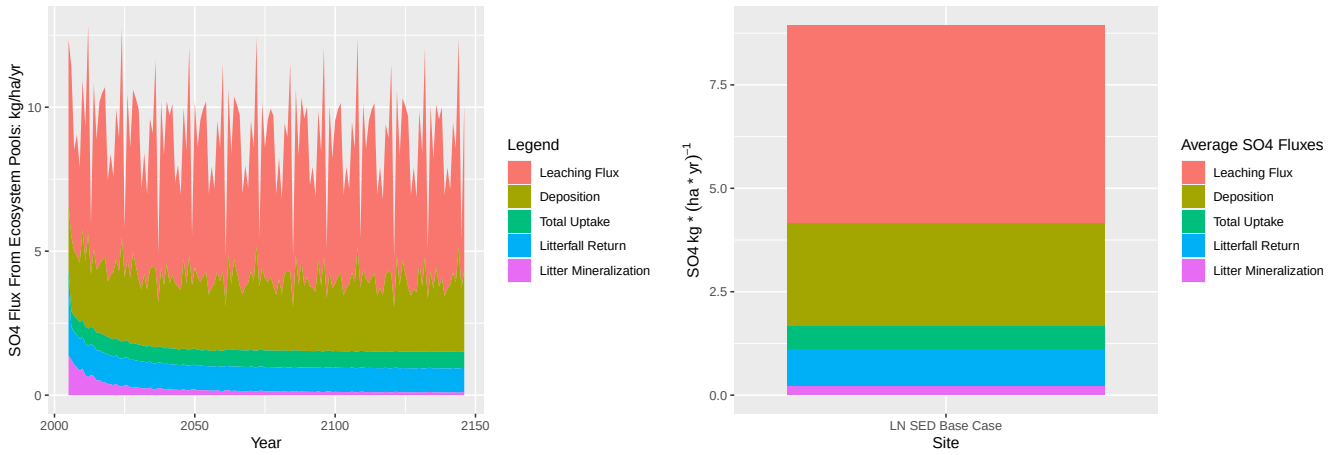
Figure 23: Magnesium input and output comparison graphs



(a) K input and output fluxes over time

(b) Total Average K input and output fluxes

Figure 24: Potassium input and output comparison graphs

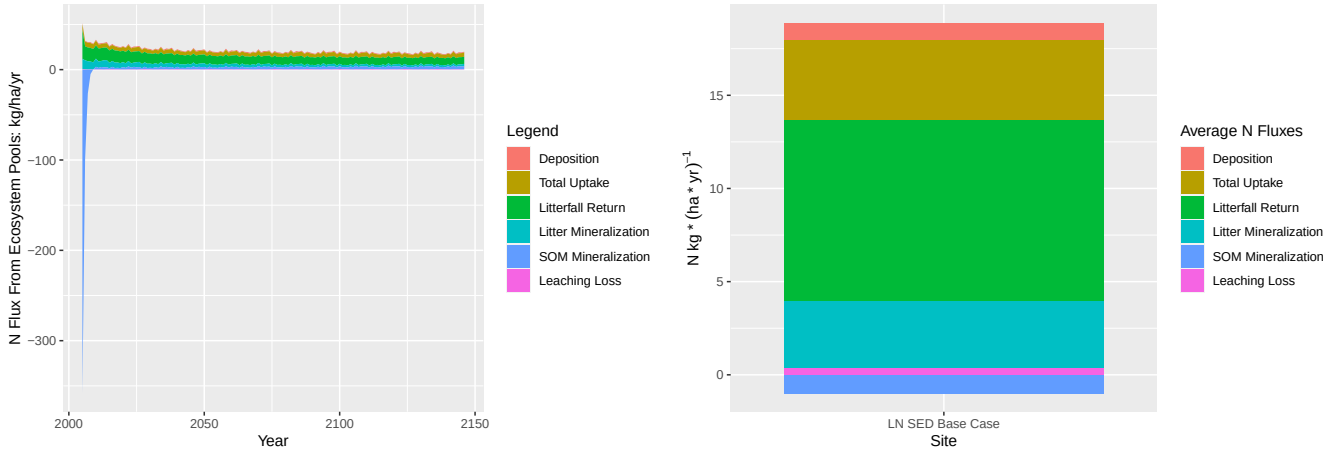


(a) S input and output fluxes over time

(b) Total Average S input and output fluxes

Figure 25: Sulfur input and output comparison graphs

There is clearly some issue with SO4 dynamics. There is both a). too much adsorbed sulfate on the AEC (by my own calculations) and b). too much leaching out every year. After looking at sulfate deposition dynamics, I think I recognize what is occurring. The depositional files are reported in SO4-S kg/ha/yr, but I believe we were analyzing it as SO4 kg/ha/yr. These values are directly transmutable by a factor of 3, so the SO4 kg/ha/yr is 3 times less reported values above.



(a) N input and output fluxes over time

(b) Total Average N input and output fluxes

Figure 26: Nitrogen input and output comparison graphs

Notice how SOM mineralization starts off highly negative (-358 kg/ha/yr N); implying a large net N uptake in the microbial pool. The mineralization then balances out and steadily returns N to the soil over time, behaving normally. I do need the microbial pool to help calibrate the N cycle, but I may need to reduce the CEC stabilized N and decrease the N-uptake in the microbial pool. These results likely imply too much N is going through the system and that the microbial pool is too large of an N pool.

Cation Exchange Capacity

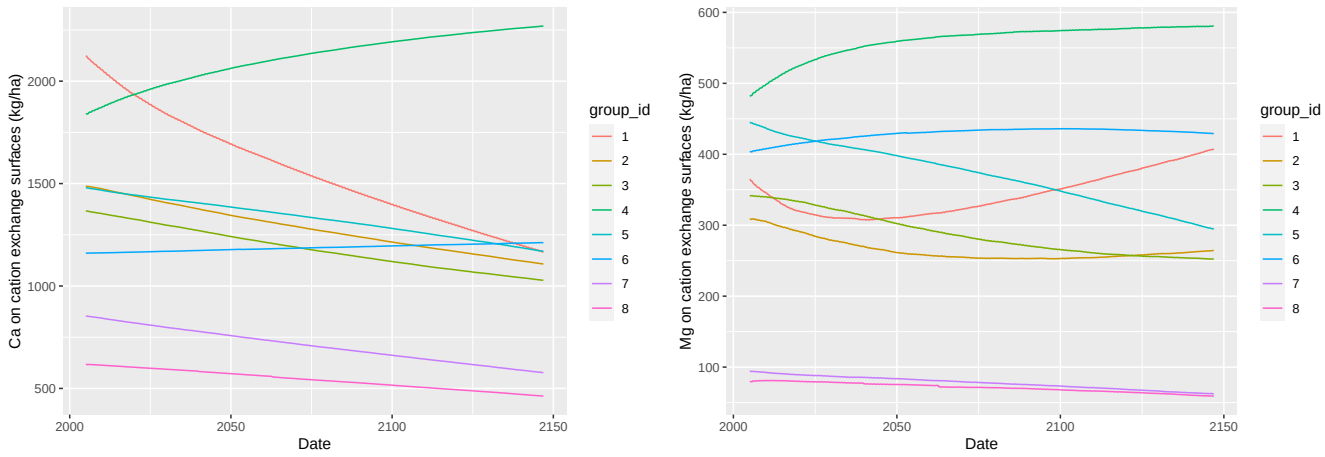


Figure 27: Calcium and Magnesium CEC adsorption over time

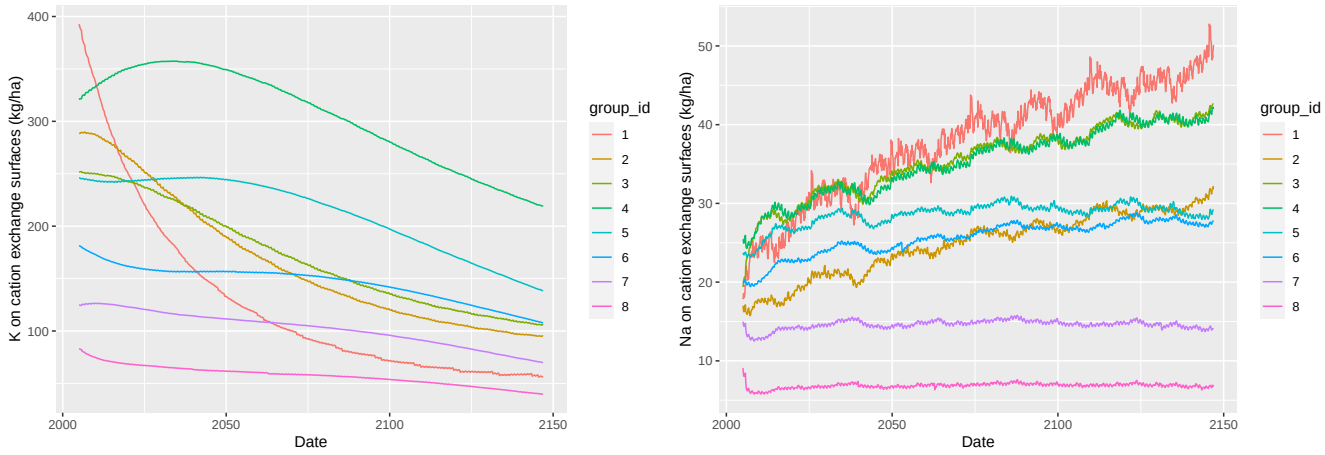


Figure 28: Potassium and Sodium CEC adsorption over time

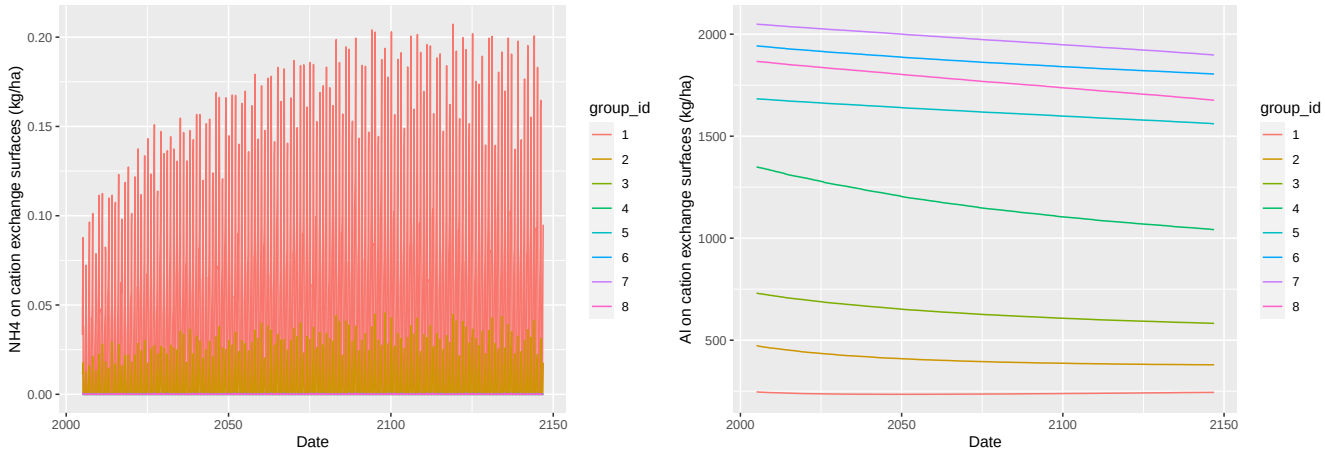
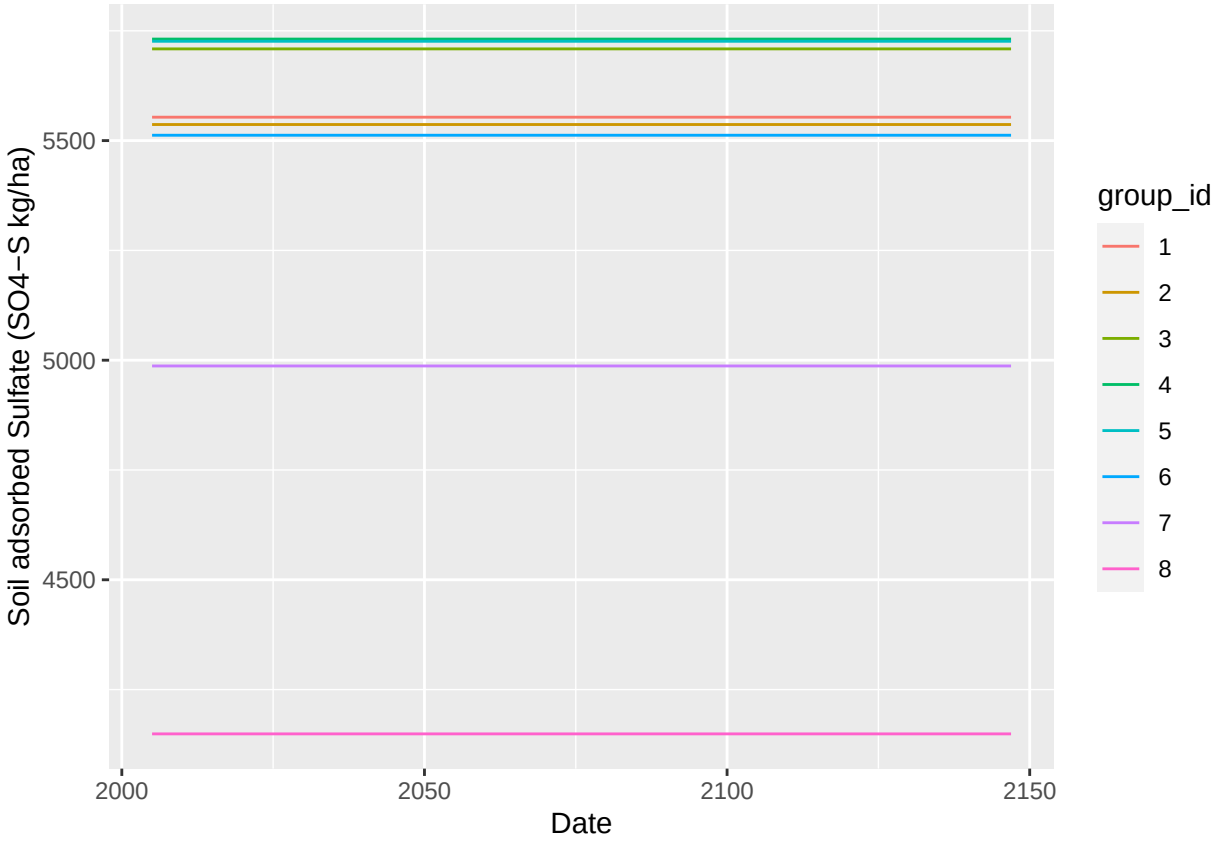
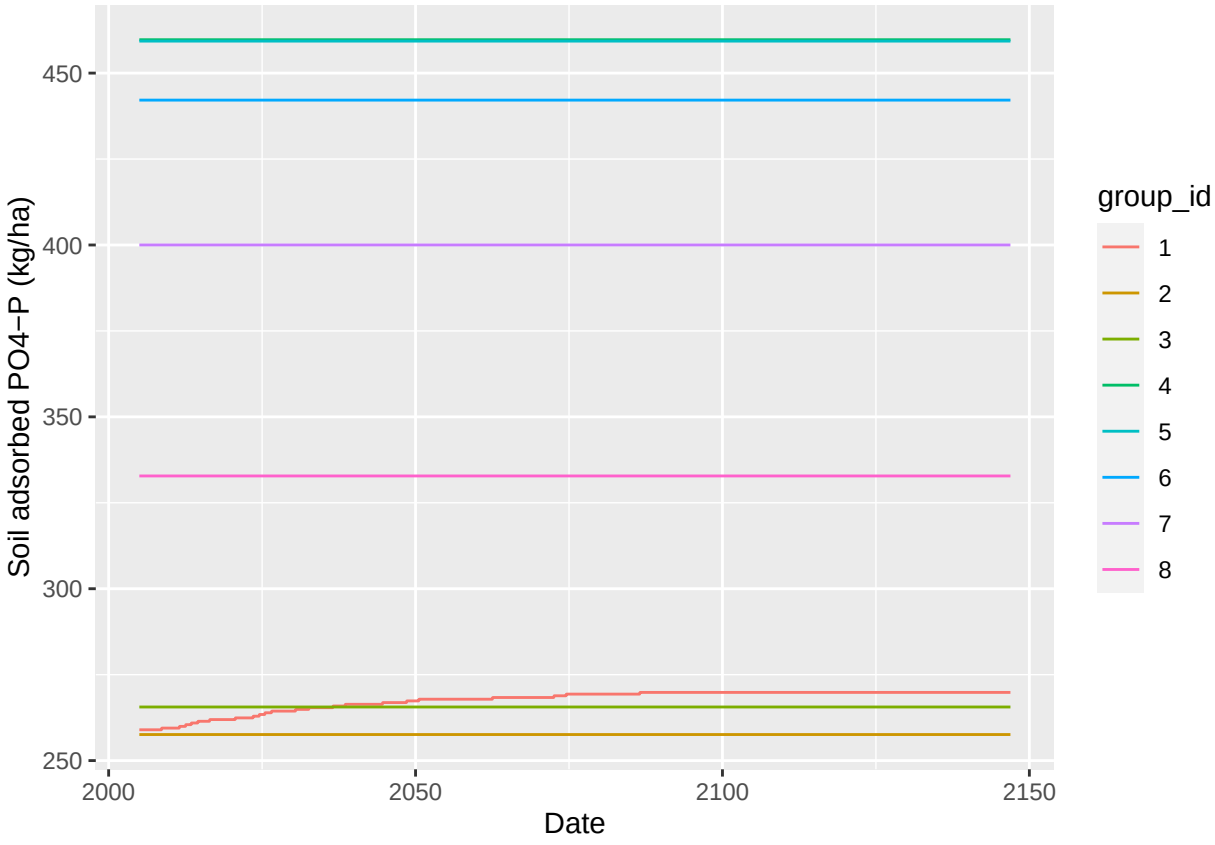
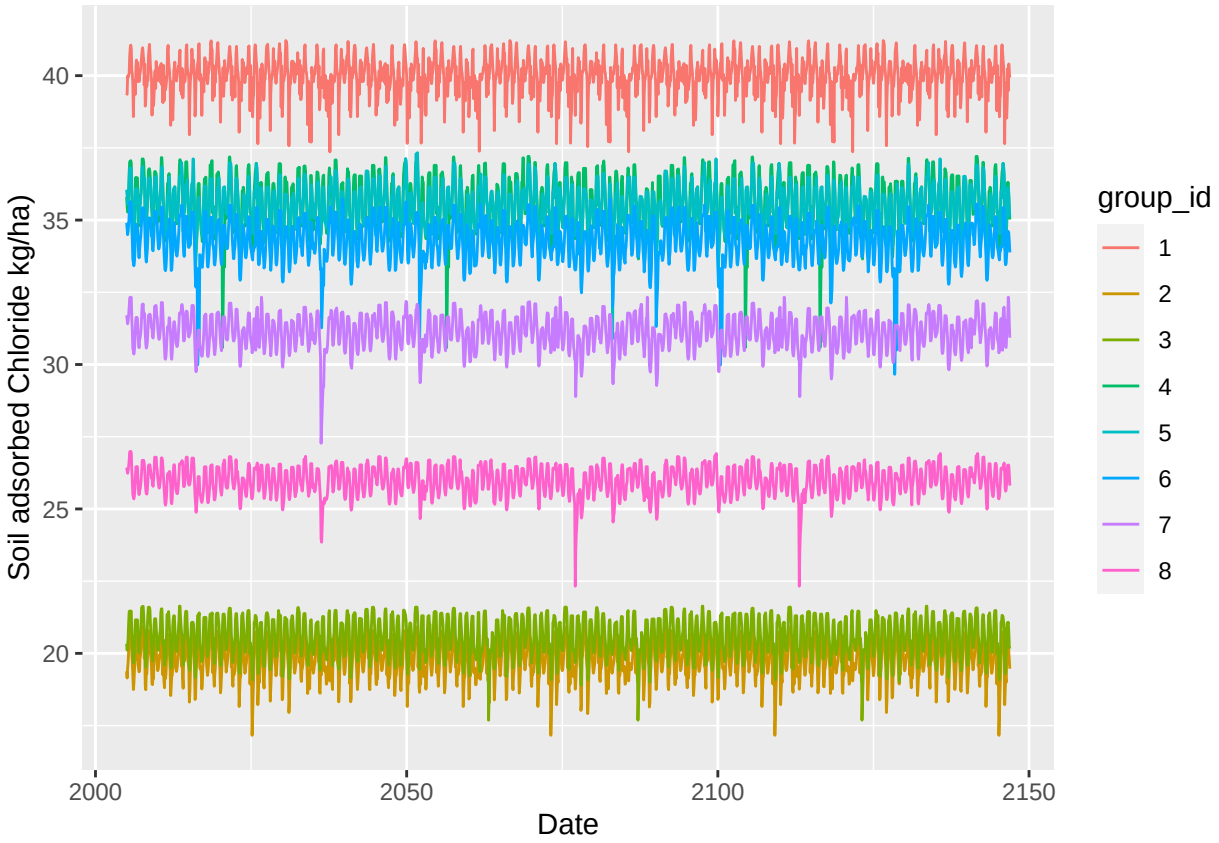


Figure 29: Ammonium and Aluminum CEC adsorption over time

Anion Exchange Capacity

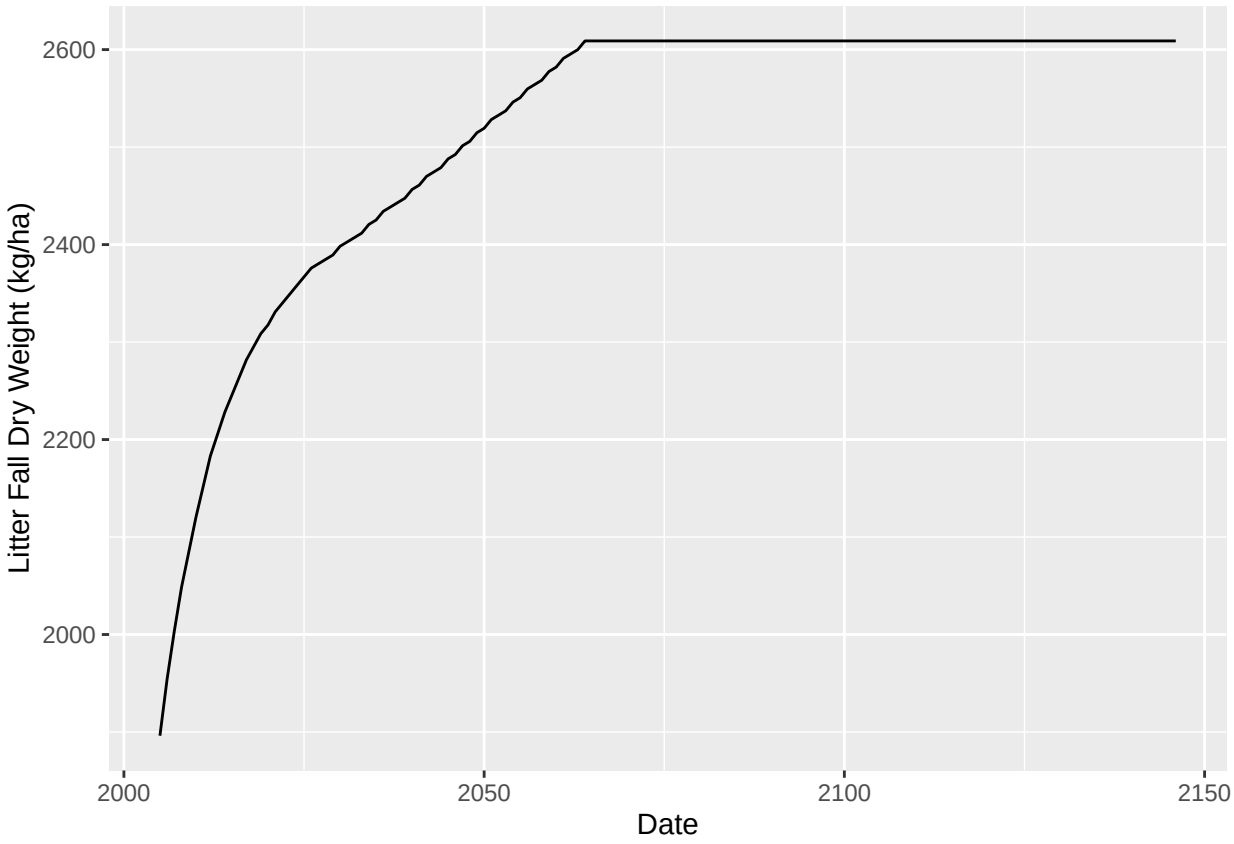






Phosphate seems stable, generally. It should be noted that P uptake is not being modeled in the foliage (it should remain constant so far) and that phosphate adsorption parameters are completely borrowed from the Burgundy site. As for sulfate, the pool of sulfate is much too large, the uptake doesn't occur to a degree which would offset SO4 adsorption this much, and pH doesn't affect sulfate adsorption in the model. I think the deposition of sulfate is too low proportional to what is-must revisit. Going forward, I will pull some sources on 1m depth S and P soil content and use them to constrain how much S and P are net sustained on the CEC.

Other


2600
2400
2200
2000
Litter Fall Dry Weight (kg/ha)
2000
2050
2100
2150
Date