

Contents

1. Introduction	1
1.1 Rationale	1
1.2 An Overview	2
2. Soil Acidification: Fundamental Concepts	7
3. The Sulfur System	15
3.1 The Sulfate Cycle	15
3.2 Sulfate Adsorption	17
3.3 The Biotic Component	21
3.4 Summary	23
4. The Nitrogen System	25
4.1 Acid–Base Relationships of the Nitrogen Cycle	26
4.2 Acid–Base Relationships of Nitrogen Inputs	27
4.3 Ecosystem Effects	30
5. Soil–Solution Interactions	33
5.1 Role of Anions	33
5.2 Ion Equilibria Model	35
5.3 Conceptualizing the Model	36

5.4	Solution Concentration Effects	41
5.5	Cation Removal, $\Delta M/\Delta H$	46
5.6	Complexes and Precipitates	47
5.7	Organic Anions	52
5.8	Summary	53
6.	Forest Element Cycling	55
6.1	Definition of Terms	55
6.2	Effects of Acid Deposition on Base Cation Flux	56
6.3	Cation Nutrient Effects	58
7.	The Aquatic Interface	61
7.1	Alkalinity Concepts	62
7.2	Alkalinity in Soil Solution	65
7.3	Naturally Acid Waters	68
7.4	Sensitivity to Water Acidification	68
7.5	Capacity versus Intensity	71
8.	Soil Sensitivity	73
8.1	Base Cation Depletion	73
8.2	Sensitivity to pH Changes	76
8.3	Sensitivity to Aluminum Mobilization	78
8.4	Summary	79
9.	Conclusion	81
9.1	Summary	81
9.2	Concepts in Transition	87
	References	88
	Appendix: Model Documentation	93
A.1	Model Description	93
A.2	Program Operation	98
A.3	Program Documentation	104
A.4	Program Listings	111
	Index	115