

Contents

1. Potential Effects of SO₂ on the Northern Mixed Prairie: Overview of the Problem	1
ERIC M. PRESTON, W. K. LAUENROTH	
1.1 Introduction	1
1.2 Characteristics of Grasslands	1
1.3 Challenge of Coal Conversion	3
1.4 Adaptive Research	5
2. The Plains Region and Experimental Sites	11
W. K. LAUENROTH, J. L. LEETHAM, D. G. MILCHUNAS, J. L. DODD	
2.1 The Northern Great Plains	11
2.2 Site Selection	14
2.3 Summary of Site Similarities and Differences	40
3. The Field Exposure System	45
ERIC M. PRESTON, JEFFREY J. LEE	
3.1 Introduction	45
3.2 The Zonal Air Pollution System (ZAPS)	46
3.3 Comparison of SO ₂ Concentrations with Actual Pollution Sources	57
3.4 Biological Significance of SO ₂ Exposure Patterns	58

4. Sulfur Deposition, Cycling, and Accumulation	61
D. G. MILCHUNAS, W. K. LAUENROTH	
4.1 Introduction	61
4.2 Standing Stocks of Sulfur	62
4.3 Dynamics of Sulfur	67
4.4 Summary	90
5. Responses of the Vegetation	97
W. K. LAUENROTH, D. G. MILCHUNAS, J. L. DODD	
5.1 Introduction	97
5.2 Canopy Structure	97
5.3 Biomass	104
5.4 Carbon Allocation	109
5.5 Leaf Area Dynamics	115
5.6 Biomass Dynamics and Net Primary Production	126
5.7 Summary	132
6. Responses of Heterotrophs	137
J. L. LEETHAM, W. K. LAUENROTH, D. G. MILCHUNAS, T. KIRCHNER, T. P. YORKS	
6.1 Introduction	137
6.2 Invertebrate Community Structure	138
6.3 Invertebrate Community Dynamics	144
6.4 Invertebrate Community Organization	149
6.5 Vertebrate Consumers	153
6.6 Summary	156
7. Simulation of SO₂ Impacts	161
J. E. HEASLEY, W. K. LAUENROTH, T. P. YORKS	
7.1 Introduction	161
7.2 Model Description	162
7.3 Model Sensitivity	168
7.4 Model Validation	170
7.5 Model Experiments	173
7.6 Model Results	173
7.7 Summary of Simulation Results	182
8. Sulfur Dioxide and Grasslands: A Synthesis	185
W. K. LAUENROTH, D. G. MILCHUNAS, T. P. YORKS	
8.1 Introduction	185
8.2 Summary of Findings	185
8.3 Conclusions	189
8.4 Comparisons with Other Ecological Systems	194
Index	199