

Soils of Iceland

Contents

Preface

- Approach – Organization of the Book
- Punctuation – Icelandic
- Acknowledgements – the Roots of the Publication

1 Introduction

- 1.1 A Book on Icelandic Soils
 - 1.2 Soil — Mold
 - 1.3 Soil Science in Iceland
- References

2 High in the North – Climate, People and Agriculture

- 2.1 The Climate
 - 2.2 The People
 - 2.3 Agriculture and Land Use
 - 2.4 Forestry in Iceland
- References

3 Geology

- 3.1 Introduction
 - 3.2 Why Does Iceland Exist? The Mantle Plume Under Iceland
 - 3.3 Volcanoes and Active Volcanic Systems
 - 3.4 Tephra and Volcanic Ash
 - 3.5 Tephrochronology
 - 3.6 Glaciation - the Quaternary
 - 3.7 Older Rocks - the Tertiary
 - 3.8 The Magnificent Glaciers
 - 3.9 Rivers and Streams
- References

4 Vegetation and ecosystems

- 4.1 Introduction
 - 4.2 Vegetation Classes and Common Plant Species
 - 4.3 Vegetation Cover and Relation to Elevation
 - 4.4 Wetlands, Drainage and Agriculture
 - 4.5 The Desert Ecosystems
 - 4.6 The Biological Soil Crusts
 - 4.7 Introduced and Invasive Species
- References

5 Andosols – Soils of Volcanic Regions

- 5.1 Introduction
 - 5.2 Classification
 - 5.3 The Colloidal Constituents of Andosols – Icelandic Soils
 - 5.3.1 Clay Mineral Formation in Andosols
 - 5.3.2 Allophane and Other Andosol Clays: Odd ‘Creatures’ Among Clay Minerals
 - 5.4 Allophane-Humus and Metal-Humus Complexes
 - 5.5 Andosols and the Carbon Cycle
 - 5.6 The Three Axis’s of Andosols: Vitric, Allophanic, and Metal-humus Complex Andosols
 - 5.7 Physical Properties
 - 5.8 Chemical Properties
- References

6 Classification and the Main Soil Types

- 6.1 Introduction and Historical Notes
- 6.2 Main Classes

- 6.3 Andosols
 - 6.3.1 The Pedogenic Parameters Underlying the Separation of Andosols
 - 6.3.2 The Andosol Classes; Brown, Gleyic and Histic Andosols
- 6.4 Histosols
- 6.5 Vitrisols
- 6.6 Other Soils
- 6.7 The Mosaic
- 6.8 The Soil Map of Iceland
- References

7 Physical Characteristics

- 7.1 Stratification of Soil Horizons
- 7.2 Texture
- 7.3 Bulk Density
- 7.4 Hydrological Characteristics
 - 7.4.1 Infiltration
 - 7.4.2 Water Retention
- 7.5 Cohesion and Erosion Susceptibility
- 7.6 Simplified Pedon Descriptions.
- References

8 Chemical Characteristics

- 8.1 Introduction and pH
- 8.2 Charge Characteristics
- 8.3 Phosphorus Retention
- 8.4 Oxalate and Pyrophosphate Extraction
- 8.5 Carbon and Nitrogen
 - 8.5.1 General Carbon Levels
 - 8.5.2 Carbon Stocks – Accumulation
 - 8.5.3 The Icelandic Wetlands in Relation to Carbon Budgets
 - 8.5.4 Nitrogen
- 8.6 Trace Elements
- 8.7 Biology
- 8.8 Chemical Data for 9 Selected Soil Pedons
- References

9 Genesis and Mineralogical Characteristics

- 9.1 Minerals
 - 9.1.1 Allophane and Imogolite
 - 9.1.2 Ferrihydrite
 - 9.1.3 Organo-mineral Complexes
- 9.2 Total Chemical Composition
- 9.3 Micromorphology
- 9.4 Genesis
 - 9.4.1 Andosols
 - 9.4.2 Vitrisols
 - 9.4.3 Histosols
- 9.5 Chemical Weathering and Denudation
- References

10 Frost and the Soil Environment

- 10.1 Arctic – Periglacial Environments
- 10.2 Water Freezes in the Soil
- 10.3 Soil Frost, Types of Ice and Surface Run-off
- 10.4 Needle-Ice Formation
- 10.5 Thufur
 - 10.5.1 Thufur Over Shallow Water Table
 - 10.5.2 'Dryland Thufur' - Thufur in Areas Without the Presence of Shallow Water Table
 - 10.5.3 Thufur, Geography and Some General Considerations
- 10.6 Solifluction

- 10.7 Patterned Desert Ground
 - 10.8 Palsas
 - 10.9 The Rock Glacier Dilemma
 - 10.10 Permafrost
 - 10.11 Construction and Soil Frost
- References

11 The Volcanic Aeolian Environments of Iceland

- 11.1 Introduction
 - 11.2 Icelandic Sand Surfaces and the Origins of the Sand
 - 11.2.1 Extent
 - 11.2.2 Sand-Fields
 - 11.2.3 Sandy Lag-Gravel
 - 11.2.4 Sandy Lava Surfaces
 - 11.3 Composition
 - 11.4 The Redistribution of the Materials
 - 11.5 Wind Erosion Rates in Iceland
 - 11.6 The Dust Hotspots: Sandy Areas and Dust Plume Areas
 - 11.7 Quantification of Aeolian Sedimentation in Iceland and Implications for Soils and Ecosystems
- References

12 Collapse, Erosion, Condition and Restoration

- 12.1 Collapse
 - 12.2 Resilience and Impacts; a Little History of Soils and Vegetation
 - 12.2.1 Evidence of Ecosystem Changes
 - 12.2.2 Aeolian Deposition Rates
 - 12.2.3 Vegetation – Pollen
 - 12.2.4 Impacts, Resilience and Stability
 - 12.3 Soil Erosion
 - 12.3.1 Erosion Forms
 - 12.3.2 Advancing Sand-Fronts (Encroaching Sand)
 - 12.3.3 Rofabards
 - 12.3.4 Erosion Spots
 - 12.3.5 Hill Slopes - Solifluction, Water Channels and Landslides
 - 12.3.6 Erosion Associated with Desert Landforms
 - 12.4 Wetland Disturbance
 - 12.5 Reading the Land – a Simple Scheme for Land Condition
 - 12.5.1 A Simple Land Condition Scheme
 - 12.5.2 Condition of Communal Grazing Areas
 - 12.6 Erosion Control and Restoration Perspectives
 - 12.6.1 Early Efforts and Drivers for Restoration
 - 12.6.2 Revegetation - Restoration
 - 12.6.3 Reclamation and Soil Development
 - 12.6.4 Many Ecosystems are Being Reclaimed
- References