Soils in the New Zealand Landscape
To the memory of our friend and colleague

JOHN DAVID STOUT
Soils in the New Zealand Landscape

the living mantle

Les Molloy

Second edition
with revised Appendix by Allan Hewitt

Photographs by Quentin Christie
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A.1
A.2
Soils are central to the lives of all New Zealanders. We build our houses, our offices, our schools, our factories, our roads and railways on soil. We grow our fruit and vegetables, our crops and timber in soils. We breed and fatten stock, we play games and race our horses on soils. This book is about the soils of New Zealand — what they are like, why there are so many different sorts of soils, how they fit into our landscapes, and how we use them.

There are many excellent books on home gardens, some on soil properties, especially fertility, in relation to agriculture, and some designed as textbooks for students. But none, until now, has bridged the gap between the interested general reader and the scientist in terms of describing soils as parts of our natural landscapes. The need for a book such as this was discussed by the New Zealand Society of Soil Science and in 1983 the decision to promote this project was taken. Geologists have filled the corresponding gap in their area of knowledge with a number of excellent books including Graeme Stevens’ *Rugged Landscape* and *New Zealand Adrift*.

Soils are some of the most complex natural systems that scientists study and attempt to understand. This understanding is necessary if society is to use soils appropriately and in a sustainable way. The complexity of soils has made the writing of this book for a non-specialist readership a daunting challenge to which Les Molloy has responded with considerable vigour and skill. Elsewhere, Les and photographer Quentin Christie have acknowledged the willing help they have received from many people in the preparation of this book. It is appropriate here to acknowledge the assistance that the New Zealand Society of Soil Science has received in promoting the project.

Preparation of the entire manuscript would not have been possible without substantial support from the New Zealand Soil Bureau and the active encouragement of the Bureau’s Directors, Michael Leamy and, latterly, Derek Milne.

Substantial financial support for the project has come from the Stout Trust. The Trust is also providing a presentation copy for each school in New Zealand with classes of Form I and above. John David Stout was a much respected and loved member of the New Zealand Soil Bureau staff and of the New Zealand Society of Soil Science. John was editor of *New Zealand Soil News*, the Society’s newsletter, for several years and he was always willing to be involved in the wider aspects of soil science and the communication of soil knowledge. I feel sure that John would have encouraged this publication wholeheartedly. Les Molloy’s decision to dedicate the book to the memory of John Stout is appropriate and will be appreciated by all who were inspired by John’s scientific example and the cheerful courage he showed living the major part of his very productive life from the confines of a wheelchair.

It is a pleasure, on behalf of the New Zealand Society of Soil Science, to acknowledge these two major contributions.

Thanks are also due to Ian F. Grant of Masterton for advice; to Ann Mallinson and David Rendel, publishers, for their belief in, and contribution to, the project; and to my fellow book sub-committee members, Rod Furkert, Keith Syers, Bob Lee, and Bruce Miller.

**Cyril Childs**  
Past-President  
New Zealand Society of Soil Science
Foreword to the second edition

It is ten years since the New Zealand Society of Soil Science published *Soils in the New Zealand Landscape*. In the Foreword to the first edition it was stated that the aim was to provide a text that describes the diversity of soils present in the New Zealand landscape, at a level that is useful to both the interested general reader and to scientists and students. There is no doubt that the book has been highly successful in this aim as the demand for it has resulted in a reprint of the first edition and this demand continues unabated.

While many books have been sold to the interested public, by far the greatest demand has been from tertiary students. *Soils in the New Zealand Landscape* has been widely used by the universities as a teaching aid, since it provides the most comprehensive description of soils and their landscape associations, and the uses and land use constraints of New Zealand soils. A limitation of the book for current teaching purposes has been the superceding of the soil classification system used throughout the book by the recent development of a new system of soil classification for New Zealand soils. In deciding to print a second edition of *Soils in the New Zealand Landscape* the New Zealand Society of Soil Science has responded to this limitation by including an Appendix describing the development and structure of the New Zealand Soil Classification, the key features of the soil orders, and a correlation with the terms used in *Soils in the New Zealand Landscape*. For reasons of cost we were not able to include the new soil classification terms in the body of the text, but we believe the Appendix will ensure that the book meets the continuing needs of the universities, as well as providing the general reader with an introduction to the modern classification of New Zealand soils.

The Society gratefully acknowledges the support of the following individuals and organisations for this project. Allan Hewitt authored the text of the revised Appendix and tackled the difficult task of comprehensively and simply describing the new classification. Landcare Research supported Allan’s involvement and provided the soil maps showing the distribution of soil orders. Several pedologists assisted in providing comment on an earlier draft of the text (Peter Almond, Megan Balks, Ben Clayden, David Lowe, Alan Palmer, Philip Tonkin, Trevor Webb) and Joanna Orwin improved its readability. Once again the Stout Trust has provided substantial financial support for this project. Mallinson Rendel have encouraged us to publish this second edition and helped with preparation of the written material. Val Orchard and Les Basher have coordinated this project for the Society. It is my pleasure to acknowledge, on behalf of the New Zealand Society of Soil Science, all these valuable contributions.

Paul Gregg
President, New Zealand Society of Soil Science

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Preface

For as long as I can remember, the variety and contrasts in the New Zealand landscape have fascinated me. I know that I am not alone in this passion, for the public's appetite for picture books of 'Scenic New Zealand' seems insatiable. Most of these landscape books, however, fail to satisfy the reader's curiosity about why there should be such diversity, or whether these landscapes reflect underlying rock or soil differences. This is a pity, because beneath the surface of the land there is another world to be discovered – of rich, sometimes vibrant, colour; earthy textures and smells; and pulsating life! Home gardeners know something of this subterranean world but only within the limits of their backyards; observant travellers may notice the changing soil pattern in roadside cuttings but be at a loss to explain why the soil at one point appears grey with deep vertical cracks yet at another point it has a series of horizontal bands, like the layers of a cake.

The science of soils, pedology, is well developed in New Zealand, as befits a nation which has traditionally earned so much of its wealth from the export of produce from the land. But the general public can be excused for often considering that we scientists are too preoccupied with fine detail. We analyse soils for nutrients, minerals and organisms; we classify them and map their distribution and indicate their suitability for carrying stock, growing crops, or supporting buildings. Yet our interest must seem starkly utilitarian; for only rarely have we stood back and celebrated our soils as something beautiful, and perhaps even mysterious. For what other natural body, worldwide in its distribution, has so many interesting secrets to reveal to the patient observer? The great events of long ago – volcanic eruptions, dust storms, floods and Ice Ages – have left their imprints as have the agricultural practices of earlier times. The soil can also tell us so much about our present-day environment. It is the home of millions of living things and the recycling factory for so much of the solar and geochemical energy that sustains life. In its form and properties it expresses the combined influences of the local climate, shape of the land, and the rocks and organisms that are broken down and incorporated into it.

To lay bare these mysteries is much too daunting a task for this book. Instead I intend to take the reader on a journey through the regions of New Zealand, using Quentin Christie's photographic skills to illustrate the sometimes subtle relationships between soil and landscape. It is partly also a journey through time, and the route I have chosen is largely determined by regional similarities in climate, topography, and soil parent materials.

Journey's end allows an evaluation of the pattern of land use witnessed en route, and a sober reflection on how a future, more ecologically conscious and conservation-oriented society would treat our priceless soil resources. I freely and warmly acknowledge the help of so many colleagues in mapping out the soils and landscapes along the way. For me the measure of success in our efforts to convey this soils information with enthusiasm and concern will be whether you, the reader, are sufficiently stimulated to start probing about in real soil landscapes during future real journeys. No guide could ask for a better commendation.

LES MOLLOY
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*for artwork for diagrams* Allan Hewitt who painted the artwork for Figs. 1.2, 1.3, 9.2, 10.2, and 13.2, and Polly McColl who painted the soil animals and habitats depicted in Plates 1.1 and 1.2.

Two people, however, stand out for the consistent encouragement they have given me – Cyril Childs for his commitment to the book and Derek Milne for so many useful discussions on the subject material. I owe them both a very real debt of gratitude.

Photographs

Most of the photographs were taken by Quentin Christie, using a 6 × 7 Pentax; lenses included 55 mm, 75 mm, 135 mm and 500 mm. Some photographs for Chapters 2 and 5 were taken with a Linhof 5 × 4 camera. Transparency film (Kodak and Agfa) was used in most cases. All aerial photography was done with Agfachrome 100 upgraded to 200 ASA.

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