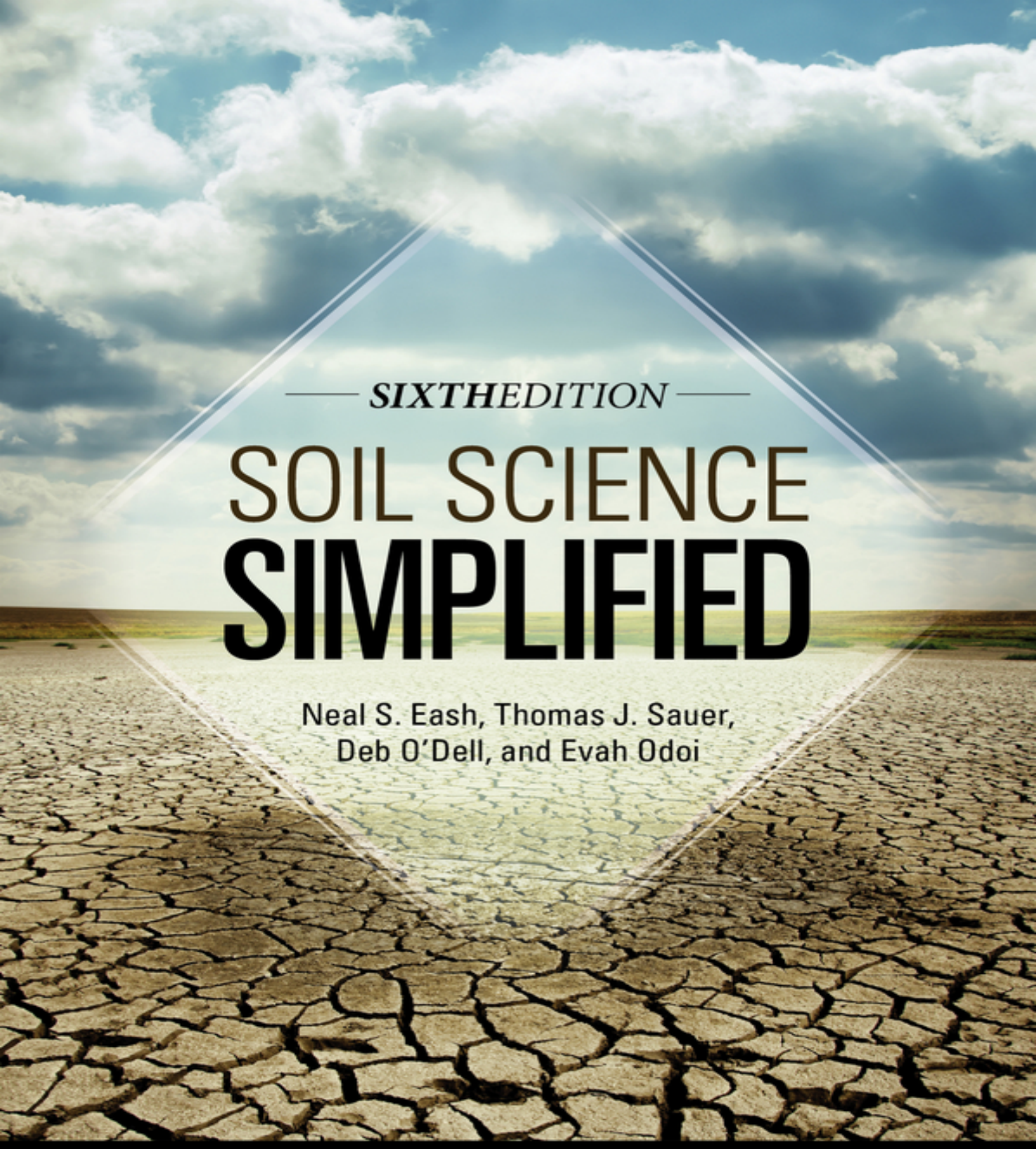

SIXTH EDITION

SOIL SCIENCE SIMPLIFIED

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WILEY Blackwell

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Soil Science Simplified

Sixth Edition

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Preface

Soil Science Simplified, Sixth Edition explains soil science in an easily understandable manner. Students, professionals, and nonprofessionals alike will gain an accurate working knowledge of the many aspects of soil science and be able to apply the information to their endeavors. The book is a proven and successful textbook and works well as assigned reading for university students in the natural sciences and earth sciences. Agricultural science courses taught at the high school or post high school level can also use this edition as a resource.

Soil science has been largely directed toward agricultural production. Farming remains at the forefront of food and fiber production and is, more than ever, concerned with soil and its properties.

Anyone who works with soil can benefit from an understanding of soil and its properties. Horticulturists, foresters, landscape architects, and similar professionals can benefit from an in-depth understanding of soils. Home gardeners can likewise benefit. Those who construct houses and other structures need to understand that the soil's physical and chemical properties can impact foundation problems. Engineers need the same understanding of soil properties as they build roads, bridges, dams, levees, and similar structures. Environmentalists and people in related areas find a working knowledge of soils useful.

There are many uses of soil-far more than for production agriculture. And everybody who works with the land in any way needs to know how to take full advantage of the information in a soil survey report. The need for an

understanding of soil is ever-present. If your profession will involve the use of soil, read and understand the information in this sixth edition of *Soil Science Simplified*. Keep a reference copy in a handy spot in your bookcase.

This sixth edition expands and updates several chapters. New approaches to the content have been incorporated to provide information needed by those professionals listed previously. A chapter on conservation agriculture (CA) has been added that describes the evolution of agricultural management practices that support and strengthen both food production and environmental resources. The illustrations and photos demonstrate the principles described in the text and enhance comprehension.

Drs. Eash, Sauer, and Odoi are experienced university professors of soil science who have taught and conducted research in soils. Through experience in the field, classroom, and laboratory, they have gained a basic, hands-on appreciation of the importance of applied soil science. This book represents their many years of experience and the desire to provide a working knowledge of soil and how its properties influence decisions on the best use of soil, whether it is used as a medium for plant growth, as a base for the foundation of buildings, or for any other purpose.

This book has been used successfully as a resource in certification programs in the agricultural industry such as the Certified Crop Advisor program sponsored by the American Society of Agronomy. We once again use many of the line illustrations by Mary C. Bratz that have appeared in earlier editions of the book which continue to be useful in communicating essential ideas and processes in soil science.

Chapter 1
Introduction to Soil

Soil is a natural resource on which people are dependent in many ways. Since the birth of the soil conservation movement in the 1930s, there has been an increased interest in conserving the soil. The environmental awareness and concerns that have occurred over the past several decades have focused attention on the need to conserve soil as a fundamental part of the ecosystem. There is, however, little public understanding of the soil's complexity.

Careful observers may see soil exposed in roadbanks or excavations, and it may be noticed that the soil does not look the same in all locations (Fig. 1.1). Sometimes the differences are apparent in the few inches of surface soil that the farmers plow, but greater variations can usually be seen by looking at a cross section of the top 3 or 4 ft. (0.9 or 1.2 m) of soil. The quality and quantity of vegetative growth depends on the properties of the soil layers.

Figure 1.1 Roadbanks can reveal the complexity of the soil.

Roads and structures may fail if they are constructed on soils with undesirable characteristics. Special care must be taken to overcome soil limitations for specific engineering uses. Satisfactory disposal of human waste and livestock manure is becoming an increasing concern, particularly where soils are used as a disposal site.

Poor yields of agricultural crops and poor growth of trees may result from a mismatching of crops and soils. This mismatching may happen because the landowner has not examined the soil horizons or understood their limitations. Soil scientists study the factors necessary for proper soil management and plant growth.

What Is Soil?

The traditional meaning of soil is that it is the natural medium for the growth of land plants. The Soil Science Society of America has published two definitions. One is "The unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants."

A more inclusive definition by the Society is "The unconsolidated mineral or organic matter on the surface of the earth that has been subjected to and shows the effects of genetic and environmental factors of: climate (including water and temperature effects) and macro- and microorganisms, conditioned by relief, acting on parent material over a period of time." The effect of each of these genetic and environmental factors will be discussed in Chapter 2 on soil formation.

Soil differs from the material from which it is derived in many physical, chemical, biological, and morphological properties and characteristics. The differences in these properties and characteristics will be discussed in subsequent chapters. Their effect on soil management decisions is important whether the soil is to be used for crop production, in an urban setting, or for roads, dams, waste disposal, and its many other uses.

Most soil consists of fragmented and chemically weathered rock which includes sand, silt, and clay separates, and it usually contains humus, which is partially decomposed organic matter. Soil is very diverse over the face of the earth, and it varies considerably. If properties of a soil are known, the soil can be properly managed, and it will serve quite well for the purpose for which it is used.

Nature and Uses of Soil

Soil is a medium in which plants are grown for food and fiber. It is fortunate that over most of the land area of the earth, soil covers bedrock to a considerable depth. If there were no soil, the continents would be wastelands of barren rock. In soil, seeds germinate and plants grow as they obtain water and nutrients from the soil. Crops of the fields and forests produce food and fiber.