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Series Preface — Drought and Water Crises

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Series Preface — Drought and Water Crises

Drought is a normal part of the climate for virtually all climatic regimes. It is a complex, slow-onset phenomenon that affects more people than any other natural hazard and results in serious economic, social, and environmental impacts. Drought affects both developing and developed countries, but in substantially different ways. Society's ability to manage droughts more effectively in the future is contingent upon a paradigm shift—moving from a crisis management to a risk-based management approach directed at increasing the coping capacity or resilience of nations to deal effectively with extended periods of water shortage.

In 2005, I edited a book for CRC Press, *Drought and Water Crises: Science, Technology, and Management Issues*. The goal of this book series is to expand on the theme of the 2005 book by providing new information and innovative approaches to drought monitoring and early warning systems, mitigation, planning, and policy and the linkages between these challenges and important natural resources and environmental issues such as climate change, including increased climate variability, water scarcity, food security, desertification, transboundary water-related conflicts, and water management, to name just a few. There is an increasing demand for more information from scientists, natural resource managers, and policy makers on issues related to these challenges that are at the intersection of drought and water management issues as pressure on the world's finite water resources intensifies.

I trust this book series will not only heighten awareness of these issues but will also offer practical and adaptable solutions to address these challenges as they unfold in the years ahead.

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Foreword — *Remote Sensing of Drought: Innovative Monitoring Approaches*

This book is the first in the series to be published by CRC Press under the book series title Drought and Water Crises: Science, Technology, and Management Issues. In 2005, I edited a book by this same title that addressed the intersection of drought-and water-related issues. Since the publication of that book, concerns have continued to mount around the linkages between drought and water issues such as climate change, water scarcity, food security, and the sustainable use and management of natural resources. These are topics of frequent concern and debate in scientific literature, the policy arena, and the media. The opportunity to expand discussion on these and other topics through a series of books aimed at drought and water management is timely and will assist scientists, natural resource managers, and policy makers in gaining a better understanding of these important issues.

Drought is a slow-onset natural hazard that is often referred to as a creeping phenomenon. The challenge of monitoring drought's onset and evolution, and identifying its termination or end, is one that scientists, natural resource managers, and decision makers have been struggling with for decades. Although all drought events originate from a deficiency of precipitation, it is insufficient to rely solely on this element of climate to assess drought's severity and resultant impacts. Assessing the impacts of a drought episode is equally challenging. An effective drought early warning system must incorporate multiple indicators, and these indicators must be routinely monitored in order to analyze both the severity of drought and its potential economic, social, and environmental consequences. Some indicators to include in a comprehensive drought early warning system are climatic elements, such as temperature; water supply indicators, such as streamflow, snowpack, groundwater levels, reservoir and lake levels, and soil moisture; and other water use indicators, such as evapotranspiration.

Brian Wardlow, Martha Anderson, and James Verdin have prepared a seminal book on the interrelationship between drought management and the application of remote sensing technologies to the complex challenges associated with drought monitoring and early warning. Remote sensing can be an effective technology in assessing a wide range of critical drought indicators. This book explores the application of these new technologies and their potential contribution to the challenges of drought monitoring and early warning. Remote sensing provides the capability for high-resolution assessments of vegetation conditions and stress in concert with estimations of evapotranspiration, precipitation, soil moisture, and groundwater, particularly in data-sparse areas. These data can greatly enhance the effectiveness of drought early warning systems. I applaud the editors of this book for their efforts in assembling a

timely and informative collection of contributions focused on new technologies that can address the challenges of drought monitoring referred to previously. Not only will this information aid many nations in the assessment of drought and its severity, but it will also contribute greatly to the efforts of many international organizations that are committed to the improved management and conservation of land and water resources and sustainable development.

The United States, through the leadership of the National Drought Mitigation Center at the University of Nebraska–Lincoln, the U.S. Department of Agriculture, and the National Oceanic and Atmospheric Administration, developed a state-of-the-art approach to drought monitoring and early warning through the creation of a web-based drought early warning system—the U.S. Drought Monitor (USDM)—in 1999. This system has been continuously evolving since its introduction and is conceptually based on a composite approach to drought monitoring by incorporating multiple drought indices and indicators into a weekly assessment of conditions. The USDM also calibrates the objective assessment of drought conditions based on multiple indices and indicators with field reports of impacts from several stakeholders and experts located throughout the country. Remote sensing tools have been integrated into this assessment process to an increasing degree as new capabilities have emerged and remotely sensed products have been developed. This drought early warning system is widely regarded as a model for other countries and is being promoted by the World Meteorological Organization and other international initiatives such as the Global Earth Observation System of Systems (GEOSS).

A comprehensive drought early warning system is an essential component of an effective drought mitigation plan and drought policy that exemplify a proactive, risk-based management approach to drought management. Indeed, it is the foundation of a drought mitigation plan because the goal of that system is to deliver reliable information to decision makers in a timely fashion. The information delivered by an early warning system when integrated into a well-designed decision support system can significantly enhance our capability to accurately assess conditions in a timely manner and, subsequently, to reduce the consequences of drought on multiple economic sectors and on the environment through the application of proactive risk-based mitigation measures. The intended outcome of this effort is to improve the drought-coping capacity of nations, leading to a more drought-resilient society. Remote sensing tools can be a significant contributor to improved drought management and this capacity-building effort.

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