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Analysis
Bioremediation
Brownfields
Chemical Oxidation
Environmental Fate
Environmental Forensics
Ethics in Environmental Practice
Heavy Metals
Modeling
Regulatory
Remediation
Risk Assessment
Sediments

Edited by

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Foreword

For the biosphere to sustain human life ecosystem components must function collectively to provide the physical, chemical, and biological services on which we depend. Energy flux, matter cycling, temperature amelioration, gas exchange, water provision, and pH constraints are among the large-scale processes on which life depends. For these and the infinitely intricate web of interactions at lower levels of the biogeochemical hierarchy to continue, each ecosystem structure and function must operate within individual limits that allow the aggregated holistic enterprise to prosper.

In the middle decades of the past century, medical researcher Hans Selye postulated and documented a General Adaptation Syndrome of consistent physiological responses of organisms to diverse challenges. His original vision of G.A. Syndrome has needed some tweaking to accommodate subsequent findings regarding the importance of nonspecific inflammatory response and the pathogenic nature of gastrointestinal ulcers. But Selye's elucidation of changes in structures and functions of an organism fighting for homeostasis under threat provided a useful framework for understanding relationships between stress and health.

Stresses beyond the individual level in the ecosystem engender homeostatic resistance (for example, fecundity drops in some populations when trophic resources are limited) and potential for permanent alteration when pushed beyond response thresholds. By analogy, ecosystem "stresses" can be characterized diagnostically and treated when long-term consequences are anticipated.

The "good earth" of the ecosystem—soils and sediments—is the source of many of the biogeochemical responses to environmental stress, and a critically important component that, when "broken"—impaired at substantive levels—must be "repaired"—restored—for the system as a whole to function effectively. Stewardship of soils and sediments for sustainability requires that we diagnose impairments, reduce or eliminate impairments by remediation, and assist whole-system recovery by restoration. The papers gathered in this volume provide a rich source of resources for evaluating, remediating, and restoring stressed soils and sediments. The authors are practitioners at the cutting edge of the field of environmental management. Their contributions published here represent reports from the front lines on the state-of-the-science of analysis, assessment, management policy, remediation technology, and regulation. The compendium you hold in your hands is a source of information to help you keep up-to-date and a challenge to you to build out the next steps in soil and sediment assessment and management. We look forward to working with you to maintain and enhance the health of the biosphere for our children and their children.

David F. Ludwig, Scientist

ARCADIS

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Edward J. Calabrese is a board certified toxicologist and professor of toxicology at the University of Massachusetts School of Public Health at Amherst. Dr. Calabrese has researched extensively in the area of host factors affecting susceptibility to pollutants and has authored more than 300 papers in scholarly journals, as well as 24 books, including: Principles of Animal Extrapolation; Nutrition and Environmental Health, Vols. 1 and 2; Ecogenetic: Safe Drinking Water Act: Amendments. Regulations, and Standards; Soils Contaminated by Petroleum: Environmental and Public Health Effects; Petroleum Contaminated Soils, Vols. 1, 2 and 3; Ozone Risk Communication and Management; Hydrocarbon Contaminated Soils, Vols. 1, 2, 3, 4 and 5; Hydrocarbon Contaminated Soils and Groundwater, Vols. 1, 2, 3, and 4; Multiple Chemical Interactions; Air Toxics and Risk Assessment; Alcohol Interactions with Drugs and Chemicals; Regulating Drinking Water Quality; Biological Effects of Low Level Exposures to Chemicals and Radiation; Contaminated Soils; Diesel Fuel Contamination; Risk Assessment and Environmental Fate Methodologies; Principles and Practices for Petroleum Contaminated Soils, Vols. 1, 2, 3, 4, and 5; Contaminated Soils, Vol. 1; and Performing Ecological Risk Assessments. He has been a member of the U.S. National Academy of Sciences and NATO Countries Safe Drinking Water Committees, and the Board of Scientific Counselors for the Agency for Toxic Substances and Disease Registry (ATSDR). Dr. Calabrese also serves as Director of the Northeast Regional Environmental Public Health Center at the University of Massachusetts, Chairman of the BELLE Advisory Committee and Director of the International Hormesis Society.

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He founded and built an environmental engineering-science consulting company. For 18 years, he has led a team of specialists in chemical engineering, civil engineering, environmental engineering, geotechnical engineering, mechanical engineering, physics, plant engineering, environmental science, geology, hydrogeology, chemistry, biochemistry, toxicology, and biology. Dr. Dragun and his associates have solved environmental issues for major companies and governments in six continents (Africa, Asia, Australia, Europe, North America, and South America).

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