

Introduction to Systems Ecology

Sven Erik Jørgensen, Copenhagen University, Denmark

A volume in the series

Applied Ecology and Environmental Management

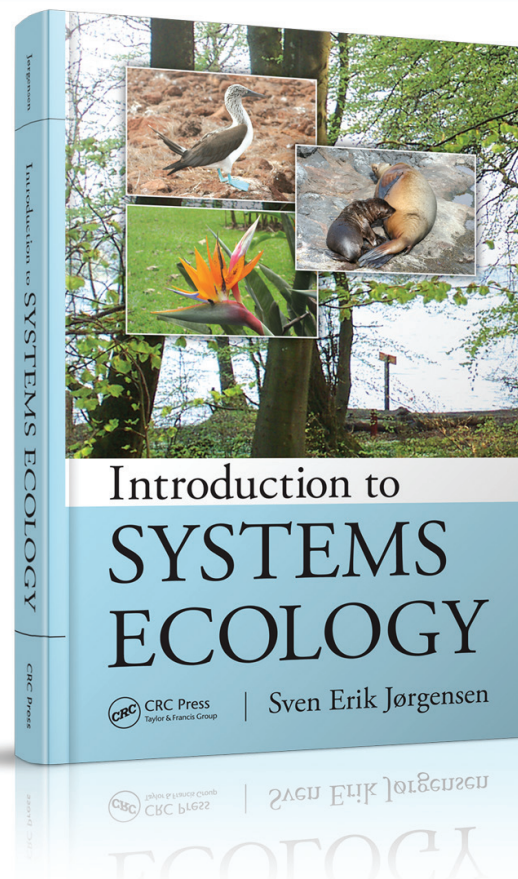
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Using quantitative methods to understand how ecological systems operate and influence each other, this textbook presents a complete and practically applicable ecosystems theory. The book is built on fourteen principles for ecological systems, including the general application of energetics principles in systems ecology. Written by an internationally recognized expert, this work provides readers with a thorough understanding of how ecosystems work and how they react to disturbances such as pollution. The holistic systems ecology described has a wide application in conservation biology, ecological modeling, assessment of ecosystem health and sustainability, and ecotechnology.

Features

- Presents a complete and practically applicable ecosystem theory that offers a general frame of reference for ecological disciplines
- Integrates four aspects of systems ecology: thermodynamics, biochemistry, network theory, and hierarchical organization
- Summarizes important points at the end of each chapter
- Includes plenty of examples and more than 100 exercises and problems for students to solve
- Contains more than 100 black-and-white illustrations and a 32-page color insert

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System Ecology: An Ecological Discipline

What Is Systems Ecology?
The Holistic Approach
Outline of the Book

PART 1

Conservation of Energy and Matter

The Conservation Laws
Other Thermodynamic Functions
Liebig's Law of Minimum
Bioaccumulation and Biomagnification
Cycling in Ecosystems and in the
Ecosphere
Energy Flows in Ecosystems

Ecosystems: Growth and Development

The Maximum Power Principle
Embodied Energy/Emergy
Ecosystem as a Biochemical Reactor
Technological and Ecological Interpretation of the Thermodynamic
Concept Exergy
Eco-Exergy and Information

Irreversibility and Order: The Second and Third Laws of Thermodynamics

Open Systems
Physical Openness
Ontic Openness
The Second Law of Thermodynamics
Interpreted for Ecosystems
The Third Law of Thermodynamics
Applied on Open Systems
Dissipative Structure and Eco-Exergy
How to Calculate Exergy of Organic
Matter and Organisms
Why Have Living Systems Such a High
Level of Exergy?

The Biochemistry of Ecosystems

A General Biochemistry for Living Systems
The First Steps of the Evolution toward a
Biochemistry
The Prokaryote Cells
The Eukaryote Cells
The Temperature Range Needed for Life
Processes
Natural Conditions for Life
Ecological Stoichiometry

The Thermodynamic Interpretation of Ecosystem Growth and Development

Introduction
The Ecosystem Development Described
by a Thermodynamic Interpretation of
the Three Growth Forms
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New Ecosystems

The Ecological Law of Thermodynamics

Introduction: Darwin's Theory
The Ecological Law of Thermodynamics
(ELT)
Some Basic Ecological Observations
(Rules) That Can Be Explained by ELT
Structurally Dynamic Models (SDMs)
The Compliance between ELT and
Evolutionary Theories

PART 2

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The Allometric Principles and
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Interactions between the Hierarchical
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The Variations and the Hierarchical
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The Frequency of Disturbances
Ontic Openness and the Hierarchy Theory

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Diversity among Individuals
Species Diversity
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Diversity and Extreme Environment

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The Ascendency
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The Application of Systems Ecology to Explain
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Application of Systems Ecology to Explain
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Application of Systems Ecology to Assess
Ecosystem Health

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*Chapters include a summary of important
points and exercises or problems.*

