

Chapter 2 Biodiversity Ecosystems And Ecosystem Services

Environmental DNA (eDNA) refers to DNA that can be extracted from environmental samples (such as soil, water, feces, or air) without the prior isolation of any target organism. The analysis of environmental DNA has the potential of providing high-throughput information on taxa and functional genes in a given environment, and is easily amenable to the study of both aquatic and terrestrial ecosystems. It can provide an understanding of past or present biological communities as well as their trophic relationships, and can thus offer useful insights into ecosystem functioning. There is now a rapidly-growing interest amongst biologists in applying analysis of environmental DNA to their own research. However, good practices and protocols dealing with environmental DNA are currently widely dispersed across numerous papers, with many of them presenting only preliminary results and using a diversity of methods. In this context, the principal objective of this practical handbook is to provide biologists (both students and researchers) with the scientific background necessary to assist with the understanding and implementation of best practices and analyses based on environmental DNA.

In 2005, The Millennium Ecosystem Assessment (MA) provided the first global assessment of the world's ecosystems and ecosystem services. It concluded that recent trends in ecosystem change threatened human wellbeing due to declining ecosystem services. This bleak prophecy has galvanized conservation organizations, ecologists, and economists to work toward rigorous valuations of ecosystem services at a spatial scale and with a resolution that can inform public policy. The editors have assembled the world's leading scientists in the fields of conservation, policy analysis, and resource economics to provide the most intensive and best technical analyses of ecosystem services to date. A key idea that guides the science is that the modelling and valuation approaches being developed should use data that are readily available around the world. In addition, the book documents a toolbox of ecosystem service mapping, modeling, and valuation models that both The Nature Conservancy and the World Wide Fund for Nature (WWF) are beginning to apply around the world as they transform conservation from a biodiversity only to a people and ecosystem services agenda. The book addresses land, freshwater, and marine systems at a variety of spatial scales and includes discussion of how to treat both climate change and cultural values when examining tradeoffs among ecosystem services.

Climate change is occurring, is caused largely by human activities, and poses significant risks for--and in many cases is already affecting--a broad range of human and natural systems. The compelling case for these conclusions is provided in *Advancing the Science of Climate Change*, part of a congressionally requested suite of studies known as America's Climate Choices. While noting that there is always more to learn and that the scientific process is never closed, the book shows that hypotheses about climate change are supported by multiple lines of evidence and have stood firm in the face of serious debate and careful evaluation of alternative explanations. As decision makers respond to these risks, the nation's scientific enterprise can contribute through research that improves understanding of the causes and consequences of

climate change and also is useful to decision makers at the local, regional, national, and international levels. The book identifies decisions being made in 12 sectors, ranging from agriculture to transportation, to identify decisions being made in response to climate change. *Advancing the Science of Climate Change* calls for a single federal entity or program to coordinate a national, multidisciplinary research effort aimed at improving both understanding and responses to climate change. Seven cross-cutting research themes are identified to support this scientific enterprise. In addition, leaders of federal climate research should redouble efforts to deploy a comprehensive climate observing system, improve climate models and other analytical tools, invest in human capital, and improve linkages between research and decisions by forming partnerships with action-oriented programs.

The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations
Routledge

The Economics of Ecosystems and Biodiversity (TEEB) study is a major international initiative to draw attention to the global economic benefits of biodiversity, to highlight the growing costs of biodiversity loss and ecosystem degradation, the benefits of investing in natural capital, and to draw together expertise from the fields of science, economics and policy to enable practical actions. Drawing on a team of more than one hundred authors and reviewers, this book demonstrates the value of ecosystems and biodiversity to the economy, society and individuals, highlights the urgency for strategic policy making and action at national and international levels, and presents examples of policies in action from around the world. It highlights the need for new public policy to reflect the appreciation that public goods and social benefits are often overlooked by a 'maximise private benefit' approach. It explores the range of instruments to reward those offering ecosystem service benefits, to reduce the incentives of those running down our natural capital, and to offer subsidies that respond to future priorities. The authors also consider two major areas of investment in natural capital - protected areas and investment in restoration. Overall the book demonstrates how we can take into account the value of ecosystems and biodiversity in policy decisions - at national and international levels - to promote the protection of our environment.

In this volume of the TEEB (The Economics of Ecosystems and Biodiversity) publication series, the key concepts of the project are applied to local and regional policy and public management. The aim is to show that by taking nature's benefits into account, decision makers can promote local development to ensure human well-being and economic growth and stability, while maintaining environmental sustainability. The book explores the potential for local development provided by an approach based on nature. It offers examples of successful implementation of this approach from across the world, highlighting the importance of local decision making in management and planning. It provides tools and practical guidance for reform, and throughout the volume the economic benefits of environmental consideration at a local level are expounded. This book is intended to offer inspiration and practical suggestions for the improvement and sustainable management of the environment and human well-being. The local aspect of this book complements the focus of the previous three volumes, completing the set to provide a comprehensive approach to simultaneously improving and maintaining economic and environmental stability, as well as human well-being. From the oceans to continental heartlands, human activities have altered the physical

characteristics of Earth's surface. With Earth's population projected to peak at 8 to 12 billion people by 2050 and the additional stress of climate change, it is more important than ever to understand how and where these changes are happening. Innovation in the geographical sciences has the potential to advance knowledge of place-based environmental change, sustainability, and the impacts of a rapidly changing economy and society. Understanding the Changing Planet outlines eleven strategic directions to focus research and leverage new technologies to harness the potential that the geographical sciences offer.

Following the much acclaimed success of the first volume of *Key Topics in Conservation Biology*, this entirely new second volume addresses an innovative array of key topics in contemporary conservation biology. Written by an internationally renowned team of authors, *Key Topics in Conservation Biology 2* adds to the still topical foundations laid in the first volume (published in 2007) by exploring a further 25 cutting-edge issues in modern biodiversity conservation, including controversial subjects such as setting conservation priorities, balancing the focus on species and ecosystems, and financial mechanisms to value biodiversity and pay for its conservation. Other chapters, setting the framework for conservation, address the sociology and philosophy of peoples' relation with Nature and its impact on health, and such challenging practical issues as wildlife trade and conflict between people and carnivores. As a new development, this second volume of *Key Topics* includes chapters on major ecosystems, such as forests, islands and both fresh and marine waters, along with case studies of the conservation of major taxa: plants, butterflies, birds and mammals. A further selection of topics consider how to safeguard the future through monitoring, reserve planning, corridors and connectivity, together with approaches to reintroduction and re-wilding, along with managing wildlife disease. A final chapter, by the editors, synthesises thinking on the relationship between biodiversity conservation and human development. Each topic is explored by a team of top international experts, assembled to bring their own cross-cutting knowledge to a penetrating synthesis of the issues from both theoretical and practical perspectives. The interdisciplinary nature of biodiversity conservation is reflected throughout the book. Each essay examines the fundamental principles of the topic, the methodologies involved and, crucially, the human dimension. In this way, *Key Topics in Conservation Biology 2*, like its sister volume, *Key Topics in Conservation Biology*, embraces issues from cutting-edge ecological science to policy, environmental economics, governance, ethics, and the practical issues of implementation. *Key Topics in Conservation Biology 2* will, like its sister volume, be a valuable resource in universities and colleges, government departments, and conservation agencies. It is aimed particularly at senior undergraduate and graduate students in conservation biology and wildlife management and wider ecological and environmental subjects, and those taking Masters degrees in any field relevant to conservation and the environment. Conservation practitioners, policy-makers, and the wider general public eager to understand more about important environmental issues will also find this book invaluable.

Authored by world-class scientists and scholars, *The Handbook of Natural Resources, Second Edition*, is an excellent reference for understanding the consequences of changing natural resources to the degradation of ecological integrity and the sustainability of life. Based on the content of the bestselling and CHOICE-awarded *Encyclopedia of Natural Resources*, this new

edition demonstrates the major challenges that the society is facing for the sustainability of all well-being on the planet Earth. The experience, evidence, methods, and models used in studying natural resources are presented in six stand-alone volumes, arranged along the main systems of land, water, and air. It reviews state-of-the-art knowledge, highlights advances made in different areas, and provides guidance for the appropriate use of remote sensing and geospatial data with field-based measurements in the study of natural resources. Volume 1, *Terrestrial Ecosystems and Biodiversity*, provides fundamental information on terrestrial ecosystems, approaches to monitoring, and impacts of climate change on natural vegetation and forests. New to this edition are discussions on biodiversity conservation, gross and net primary production, soil microbiology, land surface phenology, and decision support systems. This volume demonstrates the key processes, methods, and models used through many case studies from around the world. Written in an easy-to-reference manner, *The Handbook of Natural Resources, Second Edition*, as individual volumes or as a complete set, is an essential reading for anyone looking for a deeper understanding of the science and management of natural resources. Public and private libraries, educational and research institutions, scientists, scholars, and resource managers will benefit enormously from this set. Individual volumes and chapters can also be used in a wide variety of both graduate and undergraduate courses in environmental science and natural science at different levels and disciplines, such as biology, geography, earth system science, and ecology.

As the Gulf of Mexico recovers from the Deepwater Horizon oil spill, natural resource managers face the challenge of understanding the impacts of the spill and setting priorities for restoration work. The full value of losses resulting from the spill cannot be captured, however, without consideration of changes in ecosystem services--the benefits delivered to society through natural processes. *An Ecosystem Services Approach to Assessing the Impacts of the Deepwater Horizon Oil Spill in the Gulf of Mexico* discusses the benefits and challenges associated with using an ecosystem services approach to damage assessment, describing potential impacts of response technologies, exploring the role of resilience, and offering suggestions for areas of future research. This report illustrates how this approach might be applied to coastal wetlands, fisheries, marine mammals, and the deep sea -- each of which provide key ecosystem services in the Gulf -- and identifies substantial differences among these case studies. The report also discusses the suite of technologies used in the spill response, including burning, skimming, and chemical dispersants, and their possible long-term impacts on ecosystem services.

This multi-contributor, international volume synthesizes contributions from the world's leading soil scientists and ecologists, describing cutting-edge research that provides a basis for the maintenance of soil health and sustainability. The book covers these advances from a unique perspective of examining the ecosystem services produced by soil biota across different scales - from biotic interactions at microscales to communities functioning at regional and global scales. The book leads the user towards an understanding of how the sustainability of soils, biodiversity, and ecosystem services can be maintained and how humans, other animals, and ecosystems are dependent on living soils and ecosystem services. This is a valuable reference book for academic libraries and professional ecologists worldwide as a statement of progress in the broad field of soil ecology. It will also be of interest to both upper level undergraduate and graduate students taking courses in soil ecology, as well as academic researchers and professionals in the field requiring an authoritative, balanced, and up-to-date overview of this fast expanding topic.

This volume provides an enlightening and pragmatic approach to preserving biological diversity by gathering a wide range of peer-reviewed scientific content from biodiversity researchers and conservators from around the world. It brings comprehensive knowledge and information on the present status of conservation of biological diversity including floral, faunal, and microbial

diversity. A detailed account of recent trends in conservation and applications under changing climate conditions, focusing mainly on agriculturally and industrially important microbes and their sustainable utilization, is presented as well. Over the past five decades, extensive research work has been done on many aspects of biodiversity conservation and sustainable utilization of biological resources. This book examines this crucial issue. Chapters discuss biodiversity concepts, benefits, and values for economic and sustainable development; explores applications and strategies for biodiversity preservation; and considers the role of biodiversity conservation in public awareness services and cultural significance. The volume also examines the process of evolution and the future of biodiversity in conjunction with climate change factors, with special reference to infectious diseases.

Conservation Biology for All provides cutting-edge but basic conservation science to a global readership. A series of authoritative chapters have been written by the top names in conservation biology with the principal aim of disseminating cutting-edge conservation knowledge as widely as possible. Important topics such as balancing conservation and human needs, climate change, conservation planning, designing and analyzing conservation research, ecosystem services, endangered species management, extinctions, fire, habitat loss, and invasive species are covered. Numerous textboxes describing additional relevant material or case studies are also included. The global biodiversity crisis is now unstoppable; what can be saved in the developing world will require an educated constituency in both the developing and developed world. Habitat loss is particularly acute in developing countries, which is of special concern because it tends to be these locations where the greatest species diversity and richest centres of endemism are to be found. Sadly, developing world conservation scientists have found it difficult to access an authoritative textbook, which is particularly ironic since it is these countries where the potential benefits of knowledge application are greatest. There is now an urgent need to educate the next generation of scientists in developing countries, so that they are in a better position to protect their natural resources.

A critical synthesis of key concepts for understanding human impacts on marine ecosystems and for decision-making based on ecosystem services.

The loss of the earth's biological diversity is widely recognized as a critical environmental problem. That loss is most severe in developing countries, where the conditions of human existence are most difficult. Conserving Biodiversity presents an agenda for research that can provide information to formulate policy and design conservation programs in the Third World. The book includes discussions of research needs in the biological sciences as well as economics and anthropology, areas of critical importance to conservation and sustainable development. Although specifically directed toward development agencies, non-governmental organizations, and decisionmakers in developing nations, this volume should be of interest to all who are involved in the conservation of biological diversity.

This textbook is written to bring about an awareness of a variety of environmental concerns. It covers a wide range of topics and issues about environmental science. It attempts to create a pro-environmental attitude and a behavioral pattern in society that is based on creating sustainable lifestyles. But a textbook can hardly be expected to achieve a total behavioral change in society. Conservation is best brought about through creating a love for nature. Human well-being relies critically on ecosystem services provided by nature. Examples include water and air quality regulation, nutrient cycling and decomposition, plant pollination and flood control, all of which are dependent on biodiversity. They are predominantly public goods with limited or no markets and do not command any price in the conventional economic system, so their loss is often not detected and continues unaddressed and unabated. This in turn not only impacts human well-being, but also seriously undermines the sustainability of the economic system. It is against this

background that TEEB: The Economics of Ecosystems and Biodiversity project was set up in 2007 and led by the United Nations Environment Programme to provide a comprehensive global assessment of economic aspects of these issues. This book, written by a team of international experts, represents the scientific state of the art, providing a comprehensive assessment of the fundamental ecological and economic principles of measuring and valuing ecosystem services and biodiversity, and showing how these can be mainstreamed into public policies. This volume and subsequent TEEB outputs will provide the authoritative knowledge and guidance to drive forward the biodiversity conservation agenda for the next decade.

Resource-management decisions, especially in the area of protecting and maintaining biodiversity, are usually incremental, limited in time by the ability to forecast conditions and human needs, and the result of tradeoffs between conservation and other management goals. The individual decisions may not have a major effect but can have a cumulative major effect. Perspectives on Biodiversity reviews current understanding of the value of biodiversity and the methods that are useful in assessing that value in particular circumstances. It recommends and details a list of components-including diversity of species, genetic variability within and among species, distribution of species across the ecosystem, the aesthetic satisfaction derived from diversity, and the duty to preserve and protect biodiversity. The book also recommends that more information about the role of biodiversity in sustaining natural resources be gathered and summarized in ways useful to managers. Acknowledging that decisions about biodiversity are necessarily qualitative and change over time because of the nonmarket nature of so many of the values, the committee recommends periodic reviews of management decisions.

Urbanization is a global phenomenon and the book emphasizes that this is not just a social-technological process. It is also a social-ecological process where cities are places for nature, and where cities also are dependent on, and have impacts on, the biosphere at different scales from local to global. The book is a global assessment and delivers four main conclusions: Urban areas are expanding faster than urban populations. Half the increase in urban land across the world over the next 20 years will occur in Asia, with the most extensive change expected to take place in India and China Urban areas modify their local and regional climate through the urban heat island effect and by altering precipitation patterns, which together will have significant impacts on net primary production, ecosystem health, and biodiversity Urban expansion will heavily draw on natural resources, including water, on a global scale, and will often consume prime agricultural land, with knock-on effects on biodiversity and ecosystem services elsewhere Future urban expansion will often occur in areas where the capacity for formal governance is restricted, which will constrain the protection of biodiversity and management of ecosystem services

This book describes the biodiversity and biogeography of northern Mexico, documents the biological importance of regional ecosystems and the impacts of human land use on the conservation status of plants and wildlife. It should become the standard source document for the conservation status of species and ecosystems in this region, which is of unusual biological interest because of its high biodiversity and highly varied landscape and biological zonation.

A balanced review of differing approaches based on remote sensing tools and methods

to assess and monitor biodiversity, carbon and water cycles, and the energy balance of terrestrial ecosystem. Earth Observation of Ecosystem Services highlights the advantages Earth observation technologies offer for quantifying and monitoring multiple ecosystem fun

This comprehensive volume describes how ecosystem services-based approaches can assist in addressing major global and regional water challenges, such as climate change, biodiversity loss, and water security in the developing world, by integrating scientific knowledge from different disciplines, such as hydrological modelling, environmental economics, psychology and international law. Empirical assessments at the national, catchment and regional levels are used to critically appraise this systemic approach, and the merits and potential limitations are presented. The practicalities of this approach with regard to water resources management, nature conservation, and sustainable business practices are discussed, and the role of society in underpinning the concept of ecosystem services is explored. Presenting new insights and perspectives on how to shape future strategies, this contributory volume is a valuable reference for researchers, academics, students and policy makers, in environmental studies, hydrology, water resource management, ecology, environmental law, policy and economics, and conservation biology.

This report describes the status and trends of biodiversity and ecosystem services in the Nordic region, the drivers and pressures affecting them, interactions and effects on people and society, and options for governance. The main report consists of two volumes. Volume 1 The general overview (this report) and Volume 2 The geographical case studies. This study has been inspired by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystems Services (IPBES). It departs from case studies (Volume 2, the geographical case studies) from ten geographical areas in the Nordic countries (Denmark, Finland, Iceland, Norway, Sweden) and the autonomous areas of Faroe Islands, Greenland, and Åland. The aim was to describe status and trends of biodiversity and ecosystem services in the Nordic region, including the drivers and pressures affecting these ecosystems, the effects on people and society and options for governance. The Nordic study is structured as closely as possible to the framework for the regional assessments currently being finalized within IPBES. The report highlights environmental differences and similarities in the Nordic coastal areas, like the inhabitants' relation to nature and the environment as well as similarities in social and policy instruments between the Nordic countries. This study provides background material for decision-making and it is shown that Nordic cooperation is of great importance for sustainable coastal management and should be strengthened in future work.

This book comprehensively addresses the economic, social and institutional difficulties in conserving biodiversity and the ecosystem services that it provides. It covers a wide range of issues such as biodiversity, ecosystem services and valuation in the context of diverse ecosystems such as tropical forests, marine areas, wetlands and agricultural landscapes, non-timber forest products, incentives and institutions, payments for ecosystem services, governance, intellectual property rights and the protection of traditional knowledge, management of protected areas, and climate change and biodiversity. It also covers the application of environmental economics and institutional economics to different cases and the use of techniques such as contingent valuation

method and game theory. The book spans the globe with case studies drawn from a cross section of regions and continents including the UK, US, Europe, Australia, India, Africa and South America.

Recent scientific literature has raised many concerns about whether fisheries have caused more extensive changes to marine populations and ecosystems than previously realized or predicted. In many cases, stocks have been exploited far beyond management targets, and new analyses indicate that fishing has harmed other species—including marine mammals, seabirds, sea turtles, and sea grasses—either directly through catch or habitat damage, or indirectly through changes in food-web interactions. At the request of the National Oceanic and Atmospheric Administration, the National Research Council conducted an independent study to weigh the collective evidence for fishery-induced changes to marine ecosystems and the implications of the findings for U.S. fisheries management. *Dynamic Changes in Marine Ecosystems* provides comprehensive information in regard to these findings.

The term biodiversity has become a mainstream concept that can be found in any newspaper at any given time. Concerns on biodiversity protection are usually linked to species protection and extinction risks for iconic species, such as whales, pandas and so on. However, conserving biodiversity has much deeper implications than preserving a few (although important) species. Biodiversity in ecosystems is tightly linked to ecosystem functions such as biomass production, organic matter decomposition, ecosystem resilience, and others. Many of these ecological processes are also directly implied in services that the humankind obtains from ecosystems. The first part of this book will introduce different concepts and theories important to understand the links between ecosystem function and ecosystem biodiversity. The second part of the book provides a wide range of different studies showcasing the evidence and practical implications of such relationships.

The book starts by summarizing the development of the basic science and provides a meta-analysis that quantitatively tests several biodiversity and ecosystem functioning hypotheses. Humans have changed ecosystems more rapidly and extensively in the last 50 years than in any comparable period of human history. We have done this to meet the growing demands for food, fresh water, timber, fiber, and fuel. While changes to ecosystems have enhanced the well-being of billions of people, they have also caused a substantial and largely irreversible loss in diversity of life on Earth, and have strained the capacity of ecosystems to continue providing critical services. Among the findings: Approximately 60% of the services that support life on Earth are being degraded or used unsustainably. The harmful consequences of this degradation could grow significantly worse in the next 50 years. Only four ecosystem services have been enhanced in the last 50 years: crops, livestock, aquaculture, and the sequestration of carbon. The capacity of ecosystems to neutralize pollutants, protect us from natural disasters, and control the outbreaks of pests and diseases is declining significantly. Terrestrial and freshwater systems are reaching the limits of their ability to absorb nitrogen. Harvesting of fish and other resources from coastal and marine systems is compromising their ability to deliver food in the future. Richly illustrated with maps and graphs, *Current State and Trends* presents an assessment of Earth's ability to provide twenty-four distinct services essential to human well-being. These include food, fiber, and other materials; the regulation of the climate and fresh water systems; underlying support systems such as nutrient cycling; and the fulfillment of cultural, spiritual, and aesthetic values. The volume pays particular attention to the current health of key ecosystems, including inland waters, forests, oceans, croplands, and dryland systems, among others. It will be an indispensable reference for scientists, environmentalists, agency professionals, and students.

Advances in Ecological Research is one of the most successful series in the highly competitive field of ecology. This thematic volume focuses on large scale ecology, publishing important reviews that contribute to our understanding of the field. Presents the most updated

information on the field of large scale ecology, publishing topical and important reviews
Provides all information that relates to a thorough understanding of the field Includes data on physiology, populations, and communities of plants and animals
This book is a product of the TEEB study (The Economics of Ecosystems and Biodiversity). It provides important evidence of growing corporate concern about biodiversity loss and offers examples of how leading companies are taking action to conserve biodiversity and to restore ecosystems. This book reviews indicators and drivers of biodiversity loss and ecosystem decline, and shows how these present both risks and opportunities to all businesses. It examines the changing preferences of consumers for nature-friendly products and services, and offers examples of how companies are responding. The book also describes recent initiatives to enable businesses to measure, value and report their impacts and dependencies on biodiversity and ecosystem services. The authors review a range of practical tools to manage biodiversity risks in business, with examples of how companies are using these tools to reduce costs, protect their brands and deliver real business value. The book also explores the emergence of new business models that deliver biodiversity benefits and ecosystem services on a commercial basis, the policy enabling frameworks needed to stimulate investment and entrepreneurship to realize such opportunities, and the obstacles that must be overcome. The book further examines how businesses can align their actions in relation to biodiversity and ecosystem services with other corporate responsibility initiatives, including community engagement and poverty reduction. Finally, the book concludes with a summary and recommendations for action.

"The new book Mapping Ecosystem Services provides a comprehensive collection of theories, methods and practical applications of ecosystem services (ES) mapping, for the first time bringing together valuable knowledge and techniques from leading international experts in the field." (www.eurekalert.org).

This fully revised and expanded edition of Fundamentals of Soil Ecology continues its holistic approach to soil biology and ecosystem function. Students and ecosystem researchers will gain a greater understanding of the central roles that soils play in ecosystem development and function. The authors emphasize the increasing importance of soils as the organizing center for all terrestrial ecosystems and provide an overview of theory and practice of soil ecology, both from an ecosystem and evolutionary biology point of view. This volume contains updated and greatly expanded coverage of all belowground biota (roots, microbes and fauna) and methods to identify and determine its distribution and abundance. New chapters are provided on soil biodiversity and its relationship to ecosystem processes, suggested laboratory and field methods to measure biota and their activities in ecosystems.. Contains over 60% new material and 150 more pages Includes new chapters on soil biodiversity and its relationship to ecosystem function Outlines suggested laboratory and field methods Incorporates new pedagogical features Combines theoretical and practical approaches

The idea that nature provides services to people is one of the most powerful concepts to have emerged over the last two decades. It is shaping our understanding of the role that biodiverse ecosystems play in the environment and their benefits for humankind. As a result, there is a growing interest in operational and methodological issues surrounding ecosystem services amongst environmental managers, and many institutions are now developing teaching programmes to equip the next generation with the skills needed to apply the concepts more effectively. This handbook provides a comprehensive reference text on ecosystem services, integrating natural and social science (including economics). Collectively the chapters, written by the world's leading authorities, demonstrate the importance of biodiversity for people, policy and practice. They also show how the value of ecosystems to society can be expressed in monetary and non-monetary terms, so that the environment can be better taken into account in decision making. The significance of the ecosystem service paradigm is that it helps us

redefine and better communicate the relationships between people and nature. It is shown how these are essential to resolving challenges such as sustainable development and poverty reduction, and the creation of a green economy in developing and developed world contexts. What can ecological science contribute to the sustainable management and conservation of the natural systems that underpin human well-being? Bridging the natural, physical and social sciences, this book shows how ecosystem ecology can inform the ecosystem services approach to environmental management. The authors recognise that ecosystems are rich in linkages between biophysical and social elements that generate powerful intrinsic dynamics. Unlike traditional reductionist approaches, the holistic perspective adopted here is able to explain the increasing range of scientific studies that have highlighted unexpected consequences of human activity, such as the lack of recovery of cod populations on the Grand Banks despite nearly two decades of fishery closures, or the degradation of Australia's fertile land through salt intrusion. Written primarily for researchers and graduate students in ecology and environmental management, it provides an accessible discussion of some of the most important aspects of ecosystem ecology and the potential relationships between them. Biodiversity in Drylands, the first internationally based synthesis volume in the Long-Term Ecological Research (LTER) Network Series, unifies the concepts of species and landscape diversity with respect to deserts. Within this framework, the book treats several emerging themes, among them: · how animal biodiversity can be supported in deserts · diversity's relation to habitat structure, environmental variability, and species interactions · the relation between spatial scale and diversity · how to use a landscape simulation model to understand diversity · microbial contributions to biodiversity in deserts · species diversity and ecosystem processes · resource partitioning and biodiversity in fractal environments · effects of grazing on biodiversity · reconciliation ecology and the future of conservation management In the face of global change, integration is crucial for dealing with the problem of sustaining biodiversity. This book promises to be a vital resource for students, researchers, and managers interested in integrative species, resource, and landscape diversities.

The implementation of an ecosystem approach to fisheries (EAF) contributes to sustainable fisheries in various ways. One of them is by reviewing national policy and legal instruments to identify gaps which prevent a country from progressing towards full alignment with, and implementation of, an EAF. This diagnostic tool builds on the previous work of FAO by translating the 17 EAF components identified in the How-to Guide on legislating for an EAF into an EAF Legal Checklist for legal practitioners, policymakers and fisheries managers to use in conducting a preliminary assessment of selected policy and legal instruments and determining whether they are congruent an EAF. The outcomes of the assessment may result in decisions to amend existing national policies and/or legislation, or develop new policy and legal instruments that are aligned with the 17 EAF components, to ensure the full implementation of an EAF towards improving, in a holistic way, the conservation and sustainable use of marine resources, biodiversity and ecosystems.

Unprecedented urban growth has markedly changed ecosystem structure, function, and biodiversity, and consequently the ecosystem services our health and wellbeing depend on. To improve urban sustainability, it is important to identify opportunities to manage cities for increased ecosystem service provision. This requires understanding urban areas as spatially heterogeneous and temporally dynamic ecosystems. This dissertation combines synthesis, observational, and experimental approaches to ask how landscape structure, historical land-use, and biodiversity impact multiple ecosystem services in urban landscapes. In chapter 1, I conducted a global meta-analysis focused explicitly on the underlying ecology of urban ecosystem services, centered on the role of biodiversity in service provision. The remaining chapters focus on Madison, WI, and consider how landscape context (Chapter 2, 4) and biological invasion (Chapter 3) may influence ecosystem services in a temperate, mid-size city.

Through meta-analysis, I showed that urban biodiversity-ecosystem service research would benefit from increasing the number and types of services assessed, broadening its geographical scope, and expanding types of biodiversity measured - including consideration of non-native species. Using empirical data, I assessed the effect of spatial and temporal context on ecosystem services in Madison, a historically agricultural urban landscape. By measuring biophysical indicators of three services (carbon storage, water quality regulation, runoff regulation), I showed that considering the full mosaic of urban greenspace and its history is needed to estimate the kinds and magnitude of ecosystem services in cities, and to augment regional assessments that may underestimate urban ecosystem service supply. Using a bicycle-mounted temperature sensor, I showed that impervious surfaces and canopy cover interact to affect summer air temperature, and that urban forest management provides a powerful lever to increase temperature regulation services. Understanding invasion-ecosystem service linkages is also important in urban ecosystems - where non-native species are common. I conducted reciprocal field experiments to test whether an incipient urban invader, the Asian jumping worm, might interact with an established invasive, common buckthorn, with consequences for ecosystem services. Contrary to the "invasional meltdown" hypothesis, I found no evidence of co-facilitation, with positive conservation implications. Overall, this research has implications for using urban landscape management to enhance ecosystem service provision.

Ecosystems can be considered as dynamic and interactive clusters made up of plants, animals and micro-organism communities. Inevitably, mankind is an integral part of each ecosystem and as such enjoys all its provided benefits. Driven by the increasing necessity to preserve the ecosystem productivity, several ecological studies have been conducted in the last few years, highlighting the current state in which our planet is, and focusing on future perspectives. This book contains comprehensive overviews and original studies focused on hazard analysis and evaluation of ecological variables affecting species diversity, richness and distribution, in order to identify the best management strategies to face and solve the conservation problems. The two hundredth anniversary of the birth of Charles Darwin, February 12, 2009, occurred at a critical time for the United States and the world. In honor of Darwin's birthday, the National Research Council appointed a committee under the auspices of the U.S. National Committee (USNC) for DIVERSITAS to plan a Symposium on Twenty-first Century Ecosystems. The purpose of the symposium was to capture some of the current excitement and recent progress in scientific understanding of ecosystems, from the microbial to the global level, while also highlighting how improved understanding can be applied to important policy issues that have broad biodiversity and ecosystem effects. The aim was to help inform new policy approaches that could satisfy human needs while also maintaining the integrity of the goods and services provided by biodiversity and ecosystems over both the short and the long terms. This report summarizes the views expressed by symposium participants; however, it does not provide a session-by-session summary of the presentations at the symposium. Instead, the symposium steering committee identified eight key themes that emerged from the lectures, which were addressed in different contexts by different speakers. The focus here is on general principles rather than specifics. These eight themes provide a sharp focus on a few concepts that enable scientists, environmental NGOs, and policy makers to engage more effectively around issues of central importance for biodiversity and ecosystem management.

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