

English Abstracts

■ Ecosystem services in Israel: How a global concept has been integrated into national discourse

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This article examines the concept of ecosystem services (ES) through a historical analysis of its assimilation in Israel across research, policy, management, and planning. Using Israel as a case study, we trace the development of ES and analyze its emergence, integration, and the strengths, limitations, and debates it has generated within academia, policy, and environmental and open space management discourse. The study is based on 33 in-depth interviews with key professionals, complemented by a review of policy documents and institutional materials, and aims both to understand how national contexts shape global concepts and to strengthen the capacity of researchers and practitioners to apply the ES framework more effectively in planning and management. Our findings show that the Israeli ES discourse largely reflects global trends, with similar challenges and opportunities in its adoption, but that Israel's context, characterized by limited land, high population density, and extensive arid regions, has distinctly influenced its implementation. The prominent role of key actors in promoting ES

further highlights the concept as socio-culturally constructed and shaped by local institutional and political dynamics.

■ The importance of genetic diversity in ensuring the continuity of ecosystem services provided by forest trees in Israel

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Genetic diversity in forest trees is an integral foundation of the resilience of ecosystems and the continuity of the ecosystem services they provide. While species diversity defines the system's structure, intra-specific genetic diversity serves as the evolutionary "toolbox" that enables adaptation to extreme climate changes. Without sufficient genetic variation, tree populations lose their ability to withstand droughts and pests, leading to the collapse of the forest's regulatory, provisioning, and cultural services. Extensive genetic monitoring and conservation efforts conducted in various countries set scientific standards for managing conservation units. Israel's integration into this global effort is a strategic necessity, as it is the southern distribution limit for many species. These populations carry unique genetic traits for drought resistance, yet they suffer from fragmentation and isolation, which increase the risk of genetic erosion. This situation

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necessitates a shift from passive taxonomic monitoring to active, science-based management. To ensure the future of forests, this article calls for the implementation of advanced genomic tools that allow for the precise measurement of adaptive potential in space. Continuous monitoring of these indicators is essential for identifying populations at risk and establishing a network of *in situ* genetic conservation units supported by *ex situ* conservation. In conclusion, securing ecosystem services for future generations depends on our ability to transform genetic diversity into a strategic anchor in national management policy, aligning with leading global trends and recognizing genetic variation as nature's insurance policy against an unstable future.

■ Forest ecosystem services: Concepts, valuation methods, and applications in Israel

Nir Becker

Forests provide a wide range of ecosystem services essential to human well-being. These services fall into three main categories: provisioning services – the supply of tangible products such as timber, grazing, and raw materials; regulating services – processes that contribute to safe and favorable environmental conditions, including carbon sequestration, water regulation, and erosion prevention; and cultural services – the contribution of nature and landscape to recreation, education, heritage, and spiritual experience. Ecological supporting processes, such as nutrient cycling and soil formation, underpin all these services but are not considered services in themselves.

This paper reviews the principal economic valuation

methods used to quantify forest ecosystem services, ranging from market price and travel cost methods to stated preference approaches and advanced spatial tools such as InVEST. Special attention is given to the application of these methods in Israeli research and policy contexts. Case studies include the economic valuation of ecosystem services in the Carmel forest following the 2010 wildfire, carbon sequestration services in the semi-arid Yatir Forest, recreational values in northern Israeli forests, and the national-scale assessment conducted under Israel's Ecosystem and Human Well-being project (Hamaarag). The paper also examines Payment for Ecosystem Services (PES) mechanisms and their potential in the Israeli context, and discusses key challenges, including data limitations, valuation of intangible services, and the implications of climate change for future assessments. The paper argues that economic valuation of forest ecosystem services provides an essential evidence base for informed decision-making in sustainable forest planning and management.

■ Cultural ecosystem services in forests and woodlands

Yael Ram

This article reviews cultural ecosystem services in forests and woodlands, analyzing the link between nature and human well-being based on the "cascade model," which connects ecosystems, services, benefits, and values. The review details the diverse benefits humans derive from forests, including active recreation, aesthetic and spiritual values, and physiological, mental, and health-related benefits (such as forest medicine).

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The article examines the differences between natural and planted forests and emphasizes the significance of urban and peri-urban forests in ensuring public accessibility, particularly given transportation constraints to remote forest areas. Alongside these benefits, the analysis highlights negative ecosystem impacts – primarily the increasing risk of wildfires at the forest-urban interface due to climate change. In conclusion, the article calls for diligent management to maximize human benefits while mitigating environmental and human risks.

■ Forests, water and fire – developing a model for assessing the contribution of multi-functional forests to runoff regulation services and the effects of wildfire

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Mediterranean forests provide a wide range of ecosystem services, including runoff regulation, flood mitigation, and soil erosion control. These services are strongly influenced by vegetation structure, canopy continuity, and soil-vegetation interactions. Consequently, forest management practices – both under routine conditions and following disturbances – play a critical role in determining the provision of these services. Wildfires represent a major disturbance in forest ecosystems and may impair the forest's capacity to regulate hydrological processes, particularly in Mediterranean regions characterized by short-duration, high-intensity rain events.

This study aimed to develop a spatially explicit model to assess the contribution of forests managed by KKL-JNF in the Jerusalem Hills to

runoff regulation services, with a particular focus on multiple-use forest units. Additionally, the study examined the impact of the August 2021 regional wildfire on this service. High-resolution land cover and vegetation mapping were conducted using a combination of remote sensing and machine learning techniques. These outputs served as inputs for runoff potential estimation using the Curve Number (CN) method within the HEC-HMS hydrological model. Streamflow data from a hydrometric station downstream of the Sorek Basin were used for model calibration and validation. Fire severity was mapped using the dNBR index and incorporated into post-fire CN adjustments.

The results indicate that the developed model reliably represents runoff potential in the study area and reveal a significant decline in the forest's runoff regulation capacity following the fire. Post-fire conditions were characterized by increased CN values, a reduced rainfall threshold for runoff generation, and the emergence of surface runoff in a small sub-catchment (4.3 km²) where no runoff events were observed prior to the fire. These findings highlight the role of dense, multi-layered forests in moderating runoff and underscore the sensitivity of hydrological responses to wildfire disturbances. Integrating remote sensing with hydrological modelling enables spatially explicit and quantitative assessment of changes in the provision of ecosystem services, providing a robust decision-support basis for sustainable forest management and climate change adaptation strategies.

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■ A spatial prioritization model for managing invasive plants in KKL-JNF forests

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Invasive plants threaten biodiversity and ecosystem services in KKL-JNF forests, with the level of threat varying among species according to their biological and ecological traits. The aim of this study was to develop a spatial prioritization model for managing invasion foci of alien plant species in KKL-JNF forests, based on invasive species' traits, their spatial distribution patterns, and the level of threat they pose to forest services across different management objectives. The model integrates nine criteria: three core variables (individual density, degree of population isolation, and forest management objectives) and six spatial adjustment variables (distance from a constant propagule source, topographic elevation, proximity to roads and trails, time elapsed since the last fire,

proximity to wet habitats, and the value of natural and landscape resources). The present study outlines the rationale underlying the model and demonstrates its outputs using Menahemya Forest as a case study. Model outputs, including spatial priority maps, were evaluated together with KKL-JNF foresters and forest engineers, who provided feedback on the relevance of the criteria in the field and on the feasibility of translating the spatial products into practical management planning. This feedback was used to calibrate and improve the model in applied terms, enabling the derivation of annual and multi-annual action plans. The model provides a robust conceptual framework for setting management priorities for invasive plants in KKL-JNF forests and, more broadly, in open landscapes. Future work will include the development of a standardized monitoring protocol accessible to foresters, forest engineers, and the wider community, as well as a dynamic management platform that will automatically integrate field observations into the model, enabling continual online optimization of management priorities.

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