English Abstracts

Long-term and short-term eco-hydrological effectivity of water harvesting systems along slopes at a dryland afforestation site

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Land degradation is a persistent issue that negatively impacts dryland ecosystems. In an effort to combat this problem, extensive afforestation activities have been carried out in the semi-arid Negev region of southern Israel in recent decades. However, the long-term effects of these actions in drylands, particularly during prolonged drought episodes, remain unclear. This study investigated the impact of land-use change from intensive grazing to afforestation based on runoff-harvesting systems, on herbaceous vegetation productivity during a long-term drought.. The temporal dynamics of this impact were assessed across the multi-aged Ambassadors' Forest using normalized difference vegetation index (NDVI) data for the hydrological years 2000-2020. The study focused on three locations within the Ambassadors' Forest, namely 15-year-old, 11-year-old, and 4-year-old planted hillslopes, with undisturbed hillslopes near these sites as a control treatment.
The results revealed significant temporal variability in vegetation cover. In the short term, specifically in the first hydrological year following the establishment of the water-harvesting systems, there was a sharp reduction in mean annual NDVI, with values substantially lower than those in the control sites. However, the negative impact of land-use change decreased over time, indicating that in the long-term self-restoration processes after land-use change and the establishment of water-harvesting systems contributed to improved conservation of hillslope runoff. This positive effect was observed in the 11- and 15-year-old afforestation sites, which exhibited higher vegetation productivity than their respective control sites. Despite long-term drought during the development of the water-harvesting systems, these findings are consistent with previous studies suggesting that ecological self-restoration processes in semi-arid regions can be expected approximately a decade after the implementation of earthworks for the establishment of runoff-harvesting systems.

Yatir Forest: The effect of stand density and grazing management on a conifer forest at the desert edge

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Yatir Forest is a planted forest comprising mainly Aleppo pine (*Pinus halepensis*), bordering on

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the Negev desert in Israel. The research station in Yatir Forest became part of the Long-Term Ecological Research (LTER) network in 2009, with an experiment focusing on land use management strategies. The experimental forest plots were thinned to stand densities of 10, 20, and 30 trees per hectare, with several unthinned control plots, similar to the LTER station in the Kedoshim Forest. In addition to assessing the effects of grazing on the forest ecological functions, half of each plot was fenced off to prevent access of local herds. Tree monitoring included physiological measurements (needle length, stem diameter, root growth, seedling germination and survival) and ecological parameters (understory growth, soil moisture, etc). During the 13 years of monitoring, trees in the thinned plots (mostly in 10 trees/hectare plots) consistently exhibited enhanced growth. Contrary to our initial hypothesis that thinning would enhance tree growth due to improved water availability as a result of reduced competition from neighboring trees, light availability was found to be the most limiting factor. Our results indicate that stand density reduction enhances water use efficiency in the remaining trees and overall performance, and should be considered as a prospective forest management policy. In addition, our results indicated that natural tree regeneration is not likely in the Yatir forest, even when thinning and fencing are applied, probably due to the harsh climatic conditions of the area. The data collected from the Yatir LTER station shed light on the ecological processes taking place in this uniquely arid forest and contribute important insights for the KKL-JNF long-term forest management plans. The Yatir Forest is an important model for understanding how forests behave under climate change, and hence, the results of this experiment have global significance for long-term forest management strategies.

Martyrs' Forest – Long-Term Ecological Research Site in a planted conifer forest: Managing mature stands to form the future forest

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The long-term ecological research (LTER) site in the Kedoshim Forest was established in 2009 in order to investigate key questions regarding the management of mature conifer forests in Israel and their structuring as vital, diverse resilient forests. The research is carried out in a mature *Pinus halepensis* forest in the Judean Mountains and examines the long-term effects of various stand thinning treatments on forest tree vitality, natural regeneration, biodiversity and ecosystem function. Twelve years following the application of treatments, the study results show that stand thinning has led to a significant increase (up to four times more) in the productivity of the trees that remained after thinning, and to a substantial reduction in tree mortality rate (up to ten times less). However, the response of the remaining trees in terms of their crown size was limited, and the leaf area index (LAI – the area of leaves per unit ground area) of the forest overstory showed some inter-annual fluctuations but did not exhibit any

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consistent trend over the years. Following thinning, a substantial increase in the recruitment (up to five times more) and growth rate (up to two times more) of regenerating pines (*Pinus halepensis*) was measured. Oak (*Quercus caliprinos*) recruitment, on the other hand, decreased as a result of thinning and even some mortality was detected. The growth rate of established oaks in the forest understory, however, increased (up to three times more). Thinning affected plant species composition in the forest understory, and led to a significant increase in species richness (up to 60% more). The thinning treatments caused a decrease (up to 13% less) in the dry biomass production of the forest overstory layer (mature pine trees) and, on the other hand, led to a gradual increase in the productivity of the understory vegetation (up to eight times more). Nevertheless, at this point, the overall LAI and productivity of the overstory and understory layers together, have not yet reached the values that were recorded prior to thinning. The study findings demonstrate the long-term effectivity of stand thinning treatments for designing forest structure, controlling ecosystem dynamics and functions, and improving forest resilience in the face of increasing water deficiency resulting from climate change.

Ficus microcarpa in Israel: Past, present and future

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Ficus microcarpa s.l. is a common street tree in Israel. We review historical and biological aspects of this tree species and the steps of its acclimatization in Israel. The biotic factors that affect its success and continued planting in Israel's urban areas are discussed.

The first evidence of *F. microcarpa* acclimatization outside its native range appears in a plant catalog from Sicily by Vincenzo Tineo (1827). The earliest planting of the tree in the eastern Mediterranean was apparently in Egypt, probably in the first half of the 19th century. It was likely first brought to Israel in the mid-1920s, most probably from Egypt. Extensive planting of the species in Israel began in the 1930s, mainly in Tel Aviv. *F. microcarpa* was planted and grows throughout Israel. The species thrives along avenues mainly on the coastal plain and in the Judean foothills. Currently, there are reservations regarding new plantings due to the nuisance caused by the ripening fruits, and to some extent, because of the aggressive development of the roots that sometimes damages infrastructure.

About 42 species of herbivorous insects are found on *F. microcarpa* in Israel , of which 14 are specific, including chalcid wasps that mature in developing fruits. Three species are significant invasive foliage pests that have become established in Israel in the last decade: the leaf gall wasp (*Josephiella microcarpae*), the ficus woolly hopper (*Macrohomotoma gladiata*) and the ficus leaf-rolling psyllid (*Trioza brevigenae*).

Another significant nuisance is related to the activity of the Egyptian fruit bat (*Rousettus aegyptiacus*), which feed on the ripening fruits and whose droppings contaminate buildings around those trees. Fruit bat droppings seriously foul walls and other structures in many urban areas in Israel. Effective biological control of the wasps that induce fruit maturation is probably not feasible. However, it is likely that there are gall inducers specific to the young figs in the natural habitats of the tree.. Such gallers may disrupt the normal development of the premature fruits, and consequently their ripening.

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