



# Abstracts

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## The Establishment of Forest Resources in Israel: Policy, Action and Implications

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This paper discusses the development of afforestation policy in Israel from the end of the 19th century until 1960 and identifies the factors influencing its design and implementation. Analysis of the chronological development of the decision-making process by the organizations involved in afforestation identifies three stages characterized by changing goals and a change in the character of the forest created. During most of the period, planting forests provided a tool for realizing national goals, and policy was guided by changing tasks imposed by the officials of the Zionist movement, the British Mandate authorities and the State of Israel. Afforestation was originally perceived as an agricultural activity and subsequently as a tool for managing national land reserves and as an aid for developing Jewish settlements in the Land of Israel. The by-products, resulting from applying this policy during this period of time, have a considerable impact on the present distribution of the planted forest resources in Israel and the landscape of open spaces.

## Long Term Impact of Climatic and Hydrologic Variations on Vegetation Activity in a Semi-Arid Watershed. Sayeret Shaked Park as a Test Case

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Climatic models predict an increase in average temperature in conjunction with reduction of total rainfall depth in arid and semi-arid regions. Current climatic fluctuations aggravate ecosystem susceptibility in arid regions as a result of environmental and anthropogenic pressure. A long-term study was conducted in "Sayeret Shaked" park, located near Ofakim (figure 1) between 1991 and 2013. This study investigated the impact of rainstorm pattern (table 2), climatic properties (figure 5 A–D) and surface runoff on annual and woody vegetation in an undisturbed watershed. The data collected includes Normalized Difference Vegetation (NDVI) for the hydrological years 2000–2013 (figure 2); total annual rainfall from 1991 till 2013 (figure 3A); calculated Potential Evapotranspiration (ET<sub>0</sub>) from 1994 till 2013 (figure 4); and surface runoff volume (shown in figure 6A) taken from runoff plots near the studied watershed from 1991 till 2011. The development of annual vegetation in a specific hydrological year was affected mainly by the total annual rainfall volume, which provided the annual consumed water for the plants. Increased annual ET<sub>0</sub> by 0.01 mm had a minor effect on annual vegetation development. In contrast, woody vegetation in the watershed was significantly affected by continuous droughts that occurred during previous years, which also reduced surface runoff that can serve as a water resource for this vegetation.

## The Effect of Adding Coal Ash to Planting Pit on the Survival and Development of Woodland Transplanted Trees and Seedlings Grown in 25 liter Containers

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It is important to find uses for the large amounts of coal ash (fly + bottom) that are generated in the production of electricity at power plants. One of the main uses of the excess ash is in agriculture. An experiment was conducted adding coal ash to transplanted trees and large saplings, which examined the effect of the ash on the survival and development of the trees. Two experimental plots were established: one in the "Har Ahim Forest" and the second in the "En Tut Forest". Both sites tested the effect of coal ash with the addition of compost (30%) on transplanted Tabor oak and Kermes oak, as well as on large saplings (25 liter root ball), principally Atlantic pistacia and terebinth. Transplanting was carried out in 2012 with data gathered after three years. A significant negative correlation was found in the Har Ahim Forest between the ash-treatment of trees and tree diameter, shoot growth (vertical and horizontal), canopy diameter and tree vitality. When tree survival of trees with coal ash and control trees transplanted in Har Ahim Forest was compared, there is a significant inverse relation ( $P = 0.014$ ), i.e. the survival rate of trees receiving ash was significantly lower than that of controls. Large planted saplings at both sites were measured and no significant impact on height and lower diameter was found in the seedlings treated with coal ash compared to the control.

A possible explanation for these negative results may be related to the fact that the addition of ash raises the PH of the soil and consequently, decreases the availability of trace elements, negatively affecting the vitality and survival of the trees. Positive responses to the addition of coal ash were found in studies of soil that was slightly acidic and low in organic matter, whereas the terra rossa and brown rendzina soils of the test sites are clay and basic, conferring no advantage to the ash treatment. An important general conclusion from this study and others is that, given the strong impact of ash on many soil characteristics (physical, chemical and biological), its application should be adjusted in accordance with the ash and soil characteristics where it is to be used as well as the existing agro-climatic conditions. This study is unique compared to others involving coal ash as it is the first carried out on trees transplanted on basic clay soil.

## Pine Pitch Canker Disease Caused by the Fungus *Fusarium circinatum*

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Pine Pitch canker, caused by the fungus *Fusarium circinatum*, is one of the most important pathogens of *Pinus* species. At present, the disease occurs in forests and nurseries in various locations worldwide. It was first described in 1945 in the southeastern United States, where it was thought to be endemic; subsequent work suggested that the pathogen may be native to Mexico. Since then, *F. circinatum* has spread widely

and now occurs in Central America (Haiti and Honduras), South Africa, South America (Chile, Colombia and Uruguay), Asia (Republic of Korea and Japan) and southern Europe. Spain was the first European country where the disease was detected over ten years ago; more recently the pathogen has become established in Portugal and has also been reported in France and Italy. In adult trees the most common symptom of pitch canker is gumming of resin from cankers on the trunk, terminals or main branches. The pathogen also causes damping-off, shoot die-back and death of seedlings in nurseries. The pathogen has been reported as seedborne and can survive both superficially and internally within seeds, causing high seedling mortality rates. Until now *F. circinatum* is exclusively a pine species pathogen, although other host tree species such as *Pseudotsuga menziesii* were found susceptible to the pathogen. At least 57 species of *Pinus* are known to be susceptible to pitch canker. At present there are no means of managing the disease in adult trees in forests or plantations.

## What Makes a Biosphere Reserve Successful? Local and International Insights

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Biosphere Reserves (BR) are designed to deal with one of the most important issues facing the world today: how do we reconcile biodiversity and natural resource conservation, while allowing their sustainable use? (UNESCO 1995, Ishwaran & Persic 2008). BRs are sites, designated by UNESCO's Man and Biosphere program, with spatial, social and administrative components. The BR concept was developed over the past four decades parallel to the development of the concept of sustainability and the emerging realization regarding the importance of biological and cultural diversity. In recent decades, conservation paradigms have been changing. One particular change is the realization that in order to preserve environmental resources, they shouldn't be "protected" from the people who live around them, but rather people should have an inherent part in managing them. BRs are one of the prominent models reflecting this paradigm shift (Price 1996). However, despite decades of experience, BR success in achieving their objectives is ambiguous, and many of them (including in Israel) only bear the "label" of the BR, and do not realize the model's potential in practice (Coetzer et al. 2014, Ishwaran 2012).

This paper reviews different perception of "success" in BRs, asking: what are the various opinions regarding how a BR should function? For this purpose, we examine how different sources measure success in BRs, including (1) UNESCO, (2) the academic literature and (3) 21 stakeholders and professionals in Israel. The findings show that there is some similarity in how success is defined and measured, though each source has unique emphases. Nonetheless, there seems to be a general consensus around operational indicators such as public participation and normative objectives such as environmental benefits. Nonetheless, not all of the Israeli stakeholders and professionals see social and economic benefits as a measure of success in BRs. This suggests that although the BR model is designed to promote development and conservation, it is still perceived by most respondents as a conservation centered model, rather than as a tool for social and economic development.

## Bisphenol-A Removal by Constructed Wetland Plants

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Bisphenol-A (BPA) is a toxic pollutant used in the plastics industry and discharged into the environment.

This study tested optional removal of BPA by wetland plants. *Cyperus articulatus* and *Juncus acutus* were selected from a wetland system and the experiments were conducted in a hydroponic system.

*Cyperus articulatus* was most effective in BPA removal. At concentrations of 200 ppb removal took place within one day and high concentrations of BPA up to 10 ppm were removed within one to four days. The main breakdown product of BPA was 3-OH-BPA which is 10 times less toxic than the original pollutant.

We also identified the bacteria *Bacillus megaterium* associated with the roots of *Cyperus articulatus* and this bacterium was effective in BPA removal.

Altogether, *Cyperus articulatus* is a most effective candidate for BPA removal in hydroponic system and wetlands.

## The Effectiveness of Forests in Semi-Arid Regions in Reducing Air Pollution During Dust Storms

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Dust storms are a major source of global atmospheric particulate matter (PM) and air pollution. During dust storms, PM<sub>10</sub> (particulate matter that is less than 10 micrometers in diameter) concentrations can reach 2000 µg/m<sup>3</sup>, high levels which exceed the World Health Organization (WHO) guidelines for air quality. The objective of this study was to study the effect of forests in a semi-arid zone on air pollution during dust events. Atmospheric PM concentrations were measured during dust storms and non-dust days (a background period) in a forest transect (Lahav, Northern Negev, Israel), including populated environments near the forest (Kibbutz Lahav) and at a more distant location (Lakiya). During a background period, without dust events, the forest and its surrounding areas were characterized by lower monthly average PM concentrations (38 µg/m<sup>3</sup>) compared with areas that are not influenced by the forest (54 µg/m<sup>3</sup>). Such a difference can be significant for human health in long-term exposure. A reduction in PM concentrations in the forest was also recorded during dust storms, depending on the storm intensity and the locations of the shielded areas. Significant reduction was recorded in Kibbutz Lahav during western storms, in which the Kibbutz is on the leeward side of the forest. In these storms, lower PM levels were recorded even in the windward area (exposed to winds) of the forest compared with Lakiya. Dust particles that were deposited on the foliage were analyzed in the lab. The total dust deposit on the foliage was found to be 8.1–9.2 g/m<sup>2</sup>, which is equal to a minimum of 418 tons removed from the atmosphere by the foliage area of Lahav forest. The relative amount of PM<sub>10</sub> from the total dust was 41.7–60.2%. The results show the role of forests in reducing atmospheric PM during dust storms, thus contributing to a better air quality in the forest and its surrounding areas. This highlights an ecological service of forests, which provides support for environmental development plans for in regions that are exposed to potential risks of air pollution due to land use and/or climate changes.