

**Title:**

The potential of green roofs to provide ecosystems services

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**Abstract:**

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As forests, agricultural fields, and suburban and urban lands are replaced with impervious surfaces due to development, the necessity to recover green space is becoming increasingly critical to maintain environmental quality. Green roofs can serve as urban ecosystems that partially offset some of the negative impacts of urbanization. They can provide numerous ecological, economic, and social benefits including stormwater management, energy conservation, mitigation of the urban heat island, carbon sequestration, reduced noise and air pollution, increased longevity of roofing membranes, wildlife habitat, improved human health, and more aesthetically pleasing environments in which to work and live. Rapid runoff from roof surfaces can exacerbate flooding, increase erosion, and may result in raw sewage discharge directly into rivers. A major benefit of green roofs is their ability to absorb stormwater and release it slowly over time. Green roofs save energy in individual buildings as the growing substrate acts as an insulation layer, the plant canopy provides shade, and through evapotranspiration. These occurrences also influence the urban heat island. In addition, by sequestering carbon in plants and soils and by lowering demand for heating and air conditioning use, less carbon dioxide is released from power plants. Atmospheric emissions from power utilities are associated with acid rain, airborne particulate matter, smog, and global climate change. Plants filter particulate matter and gaseous pollutants in the air and a variety of airborne contaminants can be alleviated by green roofs which will in turn improve human health. In addition, green roofs have a longer life-span than standard roofs because they protect roof membranes from ultraviolet radiation and the extreme fluctuations in temperature; both of which cause membrane deterioration. Since roofs represent 21-26% of urban areas, they provide a unique opportunity to provide ecosystem services.