ABS-00330

Resilient trees for urban environments: the importance of intraspecific variation

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Keywords: botanical gardens, climate change, plant selection, urban forest

Trees play a major role in the Earth's biogeochemical processes, influencing soil production, hydrological, nutrient and carbon cycles, and the global climate. They store about 50% of the world's terrestrial carbon stocks, and provide habitats for a wide range of other species, supporting at least half of the Earth's known terrestrial plants and animals. Trees are not only found in forests and other natural ecosystems, but also in urban environments. Most of the human population is concentrated in cities, towns and villages, so urban trees are critical to meet on-going and future social, economic and environmental challenges. However, many urban tree populations are strongly challenged by a changing climate, outbreaks of pests and pathogens and an urban development with increasingly dense cities and a high proportion of impermeable surface materials. The importance of intraspecific variation needs to be better acknowledged in this context, since poor matching of trees and the local climate and growing conditions can lead to extensive loss of valuable trees. By using the right genetic plant material for the challenging urban environments, a more resilient tree population with a greater diversity and higher capacity for delivering ecosystem services can be gained. Here we wish to discuss the need to consider intraspecific variation when planning resilient tree populations for urban environments and how seed banks and botanical garden play important roles in efforts to improve the matching of genetic plant material for future environmental challenges. Strategies to enrich urban tree diversity and increase resilience are outlined.