Impacts of land-use/cover and climate changes in the distribution of *Pinus kesiya* Royle ex Gordon in Mt Pulag National Park, Philippines

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Abstract

Tropical montane forest (TMF) ecosystems are one of the most vulnerable ecosystems subject to both land-use/cover and climate changes. The TMFs are influenced by climatic changes because these are adapted to its local climate and have limited and fragmented suitable habitats. Apart from this, TMFs are heavily exploited by humans due to its wide array of ecosystem goods and services. Spatial distribution patterns of forest tree populations may adapt, migrate, or extirpate when their usual environmental conditions rapidly change. Thus, species distribution models (SDM) have become a useful tool to predict distributions of species under various environmental scenarios. The SDMs have been utilized over the past decades, although these were mostly applied to identify relationships between species distribution and climate. Often such models fail to incorporate land-use/cover changes (LUCC) which is the most pervasive driver of ecosystem changes in many developing countries. In the Philippines, Mt Pulag National Park (MPNP) is considered as a Center of Plant Diversity and Key Biodiversity Area for tropical montane forests ecosystem. Aside from its biodiversity, the MPNP is a watershed providing significant freshwater supply in several areas of northern and central Luzon. Within the lower montane rain forest of MPNP, *Pinus kesiya*, locally known as the Benguet pine dominates. The *P. kesiya* forests offer tangible goods such as timber, food, water, fiber, and forage for wildlife. Even though it has been recorded to tolerate wide range of environmental conditions, it was projected to be negatively impacted by future climatic changes. Moreover, *P. kesiya* forests are being transformed into other land-uses with only smaller trees remaining. This study's overall objective is to determine the potential geographic distribution of *Pinus kesiya* under current and future land-use/cover and climatic conditions in MPNP. Further, it aims specifically to: (1) estimate the relative contribution of LUC and climate on the spatial distribution of *P. kesiya*; (2) identify the shift in distribution of *P. kesiya* under current and future LUC and climate; and (3) assess the relative predictive power of MaxEnt in modelling *P. kesiya* distribution. Obtaining information about the consequences of LUC and climate changes on the species would guide in developing proper management approaches for the conservation of the national park representative of montane ecosystem.