Parameterisation and application of the forest model PICUS for Zagros forests of Kurdistan, Iran

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Abstract

The patch model PICUS v1.5 was used to simulate forest dynamics in northern Zagros forests in Kurdistan, Iran. The study aimed (1) to calibrate model parameters of population dynamics sub-models (growth, regeneration and death of trees) for the specific site and species (Lebanon oak, Gall oak and Persian oak), and (2) to simulate different management scenarios to evaluate the effect of intended management alternatives. Regarding the management influences of local people, three possible use concepts were defined: (1) pollarding in a typical regional Galazani system, (2) trees that have never been utilised under the Galazani system, and (3) formerly pollarded trees where pollarding had been stopped. Four management scenarios have been defined and simulated: (a) business as usual (MS1): in this scenario all relevant trees are pollarded and no regeneration is possible due to livestock browsing. Fuelwood demand met by collecting dead trees and cutting some live trees. (b) conservation scenario (MS2): according to the formal administrative policies, pollarding is abandoned and there is no browsing impact on regeneration. Tending actions are performed when the stem number and crown area surpass the determined thresholds. There is no cutting of live trees for fuelwood. (c) Alternative management scenario (MS3a): All trees >2 m height are pollarded. To support regeneration, every 10 years a fence with an area of 400 m^2 per hectare is established for a period of 30 years followed by overstory clearing to facilitate the growth of young trees. Tending actions and cuttings for reshaping diameter distribution are conducted considering the stem number thresholds and intended stands structures. (d) Alternative management scenario (MS3b): Utilisation, tending and fencing are conducted as in MS3a with more intensity. The results indicate that the 'business as usual' approach leads to forest degradation due to the absence of regeneration, aging trees, and continuous harvesting. In contrast, the conservation scenario enhances stand size structure and regeneration, but it does not prioritise needs of local communities, as no utilisation is permitted. The results from alternative management scenarios (MS3a and MS3b) are comparable. They enhance stand structure and promote regeneration, while also allowing local utilisation within the estimated renewability capacity of the forests.

Keywords: Forest modelling, PICUS, scenario analysis, traditional forest management, Zagros forests

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