

# The Influence of Forest Gaps on Some Properties of Humus in a Managed Beech Forest, Northern Iran<sup>1</sup>

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**Abstract**—The present research focuses on the effect of eight-year-old artificially created gaps on some properties of humus in managed beech-dominated stand in Hyrcanian forest of northern Iran. In this study, sixteen gaps were sampled in site and were classified into four classes (small, medium, large, and very large) with four replications for each. Humus sampling was carried out at the centre and at the cardinal points within each gap as well as in the adjacent closed stand, separately, as composite samples. The variables of organic carbon, P, K, pH, and total N were measured for each sample. It was found that the gap size had significant effect only on total N (%) and organic carbon (%) in beech stand. The amount of potassium clearly differed among three positions in beech forest. The adjacent stand had higher significantly potassium than center and edge of gaps. Different amount of potassium was detected in gap center and gap edge. Comparison of humus properties between gaps and its adjacent stand pointed to the higher amount of potassium in adjacent stand than that in gaps but there was no difference between them regarding other humus properties. According to the results, it can be concluded that there is relatively similar condition among gaps and closed adjacent stands in terms of humus properties eight years after logging in the beech stand.

**Keywords:** Gap, Beech, Humus, Hyrcanian forests

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## INTRODUCTION

Forest ecosystems are commonly exposed to human-induced and natural disturbances such as harvesting and wind storm [11]. Disturbances such as diseases [14, 26, 30], storm [2, 9], fire [1, 32] and harvesting [1, 14, 29] can injure or remove trees that in turn create opening area called canopy gaps. Microclimates within and around gaps immediately change after gap formation [32]. Canopy gap formation is considered to be an important incident in the structuring of many forest communities [17]. Forest soil receives less litter-fall when the artificial gaps are created- although the amount of litter-fall depends on the intensity of the operations- and as a result diminishes nutrient transfer to the soil [13]. Therefore, the applied logging system may influence the soil features which have an effect on humus decomposition processes and induces several changes in nutrient cycling [19, 20] Fabiánek et al. [3] believes that the condition and form of humus in forest management are among major parameters affecting the condition and growth of forest stands. The extant organic matter in forest soils contributes to nutrient cycling and forest soil structure is influenced by forest harvesting and the application of mechanical disturbances. The knowledge of chemical and physical properties of soils constitute one of the key elements in evaluating the capacity of sites to sustain productive forests

[24]. Logging can form canopy gaps within forest [9]. Hyrcanian forests of Iran, just like other forests, have been logged under different silvicultural operations such as shelterwood and selection methods [23, 27] that created different gap sizes within these forests. These forestlands are located in the northern part of Iran, also known as the Caspian forests and belong to the end of the third geological era [5]. So far, few studies have been conducted regarding the effect of gap size in hyrcanian beech forests, especially, its effects on soil properties. Thus, this study aimed at investigating the impact of gap size on humus features to evaluate the effect of harvest-created gaps in beech forest 8 years after gap formation. In particular, the research attempted to answer the following questions:

1. Does gap size have any effect on humus properties in a managed beech forest?
2. Is there any difference between artificial gaps and unharvested beech stand in terms of humus properties?

The results of the study are helpful to offer information for forest management to improve silvicultural systems in Hyrcanian forests.

## MATERIALS AND METHODS

### *Study Area*

The study was conducted in beech selection forest which is located in Alandan district, compartment 3

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