

## Effect of Gap Size on Natural and Artificial (*Prunus avium* L.) Tree Regeneration in a Beech-Dominated Mixed Forest in Northern Turkey

Derya Eşen<sup>1</sup>, Günseli Erdoğan<sup>2</sup>

<sup>1</sup>Faculty of Forestry, Düzce University

<sup>2</sup>Alaplı Forestry Subdirectorates, Zonguldak Regional Forestry Directorate

The northern mountain slopes of the Black Sea Region (BSR) of Turkey support mesic broadleaved forests. Past high-grading and forest management practices had converted the once-species rich the BSR forests to predominantly pure oriental beech (*Fagus orientalis* Lipsky) and beech-dominated mixed broadleaved forests. Mixing wild cherry (*Prunus avium* L.) – a tree species with great ecological (enhanced biodiversity, wildlife), economic (valuable wood), and social (apiculture) values – into these forests will enhance the multi-functionality of the region's forests. Gaps created naturally or artificially in a stand canopy supports a highly heterogeneous micro-environment and vegetation. This study investigated the effects of small (0.02 ha) and large gaps (0.05 ha) on the natural regeneration of beech-dominated mixed broadleaved forests and the growth of one-year old wild cherry seedlings planted under the gaps.

32 gaps of two different sizes (16 small gaps with 12 m and 16 large gaps with 25 m radius) were created in a beech-dominated mixed broadleaved forest of Zonguldak Kdz. Ereğlisi Kocaman Forest Sub-Directorate in 2006 in the western BSR of Turkey. One-year old wild cherry seedlings of a native provenance were planted in 3 x 3 m spacing under each of the gaps at the end of the year. Instantaneous solar radiation was measured in three ecological zones (center, transitory zone, and neighboring closed forest) in each gap between April and October, 2007. One year after planting, seedling growth was compared by gap size and eco-zone in the gap. Natural regeneration in gaps was compared similarly in May 2008.

No significant instantaneous solar radiation difference was found between the large (0.2 ha) and small (0.05 ha) gaps. However, there were substantial within-gap differences in solar radiation. The gap center received a significantly greater mean percent relative solar radiation when compared with the transitory zone and the neighboring closed forest. The amount of solar radiation reaching the forest floor increased as the gap size increased. The planted wild cherry – a typical light-demanding tree species - seedlings tended to grow greater in the large gaps when compared to those planted under the small gaps, although the difference was nonsignificant.

One year after the gaps were created, no natural tree regeneration occurred in the neighboring closed forest. A significantly greater mean number of wild cherry natural seedlings was found in the large gaps when compared to that in the small gaps, regardless of eco-zones in the gap. The large gaps that received a substantially greater solar radiation seemingly suited the ecology of wild cherry. Mean number of natural seedlings of beech was similar between the center and transitory zone for the small gaps. However, beech regeneration was substantially greater (1.5 fold) in the transitory zone when compared to that in the center zone for the large gaps. This regeneration behavior is probably attributable to beech's relatively heavy seed weight, shade-tolerance and shelter requirement early in its establishment. Similarly, Anatolian chestnut (*Castanea sativa*) - a semi-shade tolerant tree species with heavy seeds - naturally regenerated the most (70%) in the transitory zone than the center, regardless of gap size.

In conclusion, small gaps (0.2 ha) should be preferred to naturally regenerate mixed stands composed of shade-tolerant broadleaved tree species including beech and chestnut whereas large gaps (0.5 ha) are required to establish the natural or artificial regeneration of light-demanding broadleaved tree species including wild cherry in the mixed stands of the BSR of Turkey.

Derya Eřen, Düzce University Forestry Faculty,  
Address: Düzce Üniversitesi Orman Fakültesi, Konuralp Yerleşkesi, 81620, Düzce, TURKEY.  
E-mail: [guzelfethiye@yahoo.com](mailto:guzelfethiye@yahoo.com), [deryaesin@duzce.edu.tr](mailto:deryaesin@duzce.edu.tr)  
Phone: +905052585798  
Fax: +903805421136