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Management of Regeneration Around Dead Treesand Help to Forest Restoration, Caspian Beech Forest, North of Iran

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Abstract. The main objective of this studythat carried out in North of Iranwas investigation of dead trees roles on naturally restoration of forest ecosystem. In this research dead tree divided in four classes and crown gap above them sizes divided in 5 groups too. Then seedlings around them in circular area with 5 meter radius were recorded. Mean comparing of average frequency of seedlings, with one-way ANOVA test, was done. Variance analysis according to the data, indicated that there doesn't exist a significant difference between average number of seedlings that settle around dead trees with various decay classes, but there is a significant difference between number of seedlings under different sizes of Gaps, around dead trees, (in 5% confidence limit). Results showed that mostly of plots around the dead trees had the natural seedlings settlement, except around the dead trees with so large canopy gaps above them, in this case the raspberry, fern and other weed plants didn't allow to regeneration settlement, therefore there should be a suitable management to help regeneration. Under so large canopy gaps,weeding operationto help regeneration settlement was doing, results showed that due to light competition between seedlings and weed plants, weed plants eliminated and seedlings settle successfully.

Key words: One-Way ANOVA test, Canopy Gap, Weeding operation

1. Introduction

Dead trees, such as Snags and Downed logs exist in forests that there is naturally in -intact forest, dead trees appear in forest at the result of aging and become old or unfavorable environment attacks. Dead trees cause ecosystem dynamics in forests (Lowis, 1998). this study was carried out for investigation of dead trees effects on regeneration settlement by gap opening in forest crown due to their mortality. Studies of Habashi in 1997, about the dead trees effects on natural regeneration of virgin Beech forest in Vaz, Mazandaran province, showed that dead trees had affirmative effects on Elm regeneration. F.Wright researches in 1998 indicated that canopy gap size can play a major role in determining composition of tree regeneration after disturbance. The effects of different position within gaps of dead trees and within the intact forest have received less study. Kiasari and Rahmani studied in 2001, showed that in crowded stands, frequency of Beech and Hornbeam seedlings around dead trees was more than them around alive trees and in medium crowded stands only frequency of Beech seedlings was more than around alive trees.

2. Materials and Methods

2.1. Study Area

The research site was located in a Beech stand in Chelir district of Mazandaran province, Caspian forest in North of Iran. Area extent of forest was 1900 hectares, takes place between 750-1750 meter altitudes. The major tree species existence was *Fagus-Carpinum, Fagetum, Fagus-alnus, Alnus-Fagus. Aceratum, Quercus-Carpinum,*furthermore there was especial types that observed in the stand. *Fagus-Alnetus* and *Fagus-Aceratum* stands as a result of quaintly characteristics and *Fagus-Tiliatum*. Acer and *Fagus-Quercutum* because of species increased the ecological valuation.

2.2. Methods of Study

For investigation of dead trees effects in forest regeneration, after research of forest area and choosing a suitable 50 hectares plot seedlings around dead trees in the study area was recorded, the area around Snags in 5 meter diameter and in Downed logs a area like rectangular that with 4 meter width (2 meter in each both sides), and it's length, seedlings with species separationwas recorded. On the other hand during the seedling measurement the gaps that exist above dead trees was measured and decay classes of dead trees was determined. Decay classes of dead trees was divided in 4 classes and determined, **Decay class 1:** Tree has become drying, don't exist leafs or sprouts and tree bark and phenotype hasn't big change, **Decay class 2:** beginning of decaying, wood of tree become rote, color of wood change and become brown and contain white rots. But wood is hard and physical and chemical characteristics doesn't change yet, **Decay class 3:** decaying of wood is improved, color of it completely change, and physical, chemical characteristics change completely too, wood cracking, and last it's primary shape and form and **Decay class 4:** the wood of tree become perfectly decay, and simply become piecemeal under week pressure. In this study for investigation of dead trees gaps on the forest crown above the dead trees divided in 5 groups; closed gaps with 0 diameter, 0-12 square meter is gap with very small area size, 12-50 square meter is gap with small area size, 50-113 square meter is gap with medium area size and <113 square meter is gap with large area size.

3. Results

As a result of in most of cases size of gaps had an inverse relationship with decay degree of dead trees. Figure 1 shows the frequency of different sizes of gaps that created by dead trees in forest crown in different decay classes, according to the curve with increasing of decay degree, sizes of gaps decreasing. After times intensity of decay degree increasing and gap above dead tree by neighbor trees to receiving more

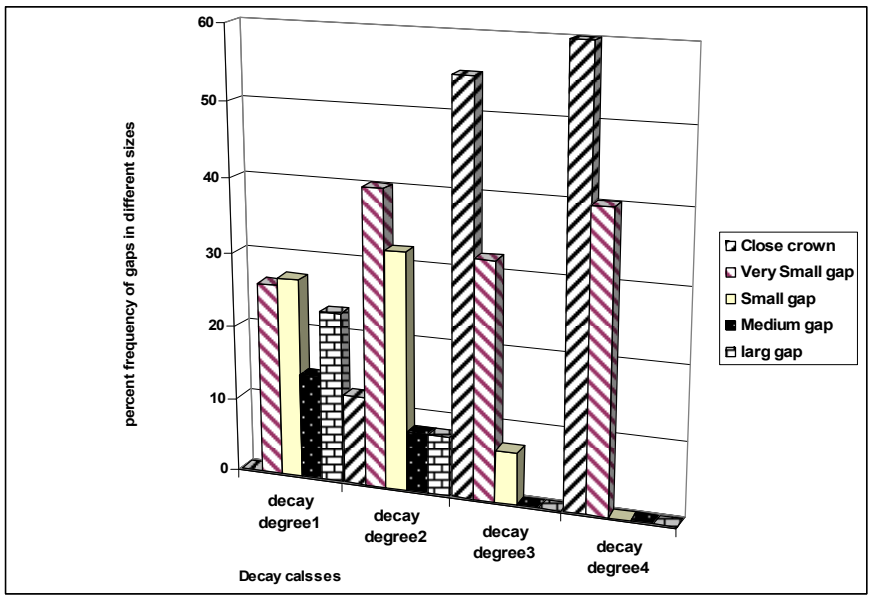

Fig. 1: Frequency of different sizes of gaps in percent, which created by dead trees in forest crown in different decay classes- in study area

Lights become closing. According to the figure 1 in decay class 4, gaps with medium area sizes don't exist. Figure 2 and 3, shows mean number of seedlings (in hectare) around dead trees with different decay classes and under different gap sizes respectively. The major number of seedlings was observed around dead trees with decay class 3, and after it in there was around dead trees with decay classes 4, 2 and 1 respectively. In 4 decay degree of dead trees cellulose materials of tree (wood) is rotten in favorable position and is made a good bed for settlement of seedlings. Therefore according to the curve number 2, frequency of seedlings around dead trees with decay class 3, is higher than others.

According to curve number 3, frequency of seedlings under closed crown that was open when tree died, after it number of seedlings under gaps with Medium area, very small, Small and large area sizes decrease respectively.

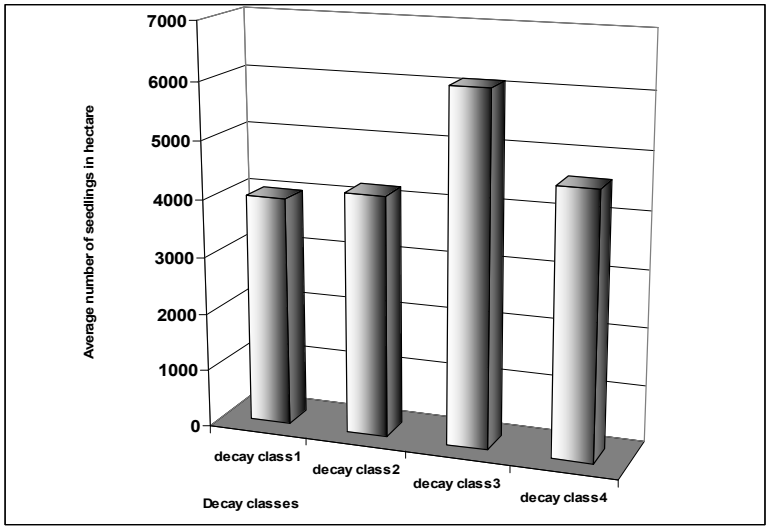

Fig. 2: Average number (in hectare) of seedlings around dead trees with different decay classes- in study area

In open crown (gap with large area size, higher than 113 square meter), as a result of high rate of sun light and increasing humidity of surface layer of soil and increasing the number of other plants species under gap, that enter to the competition with the seedlings caused the unfavorable effects in seedlings settlement thus the number of seedlings decrease, (HabibKaseb, 1992), even though the future of this competition will be with seedlings.

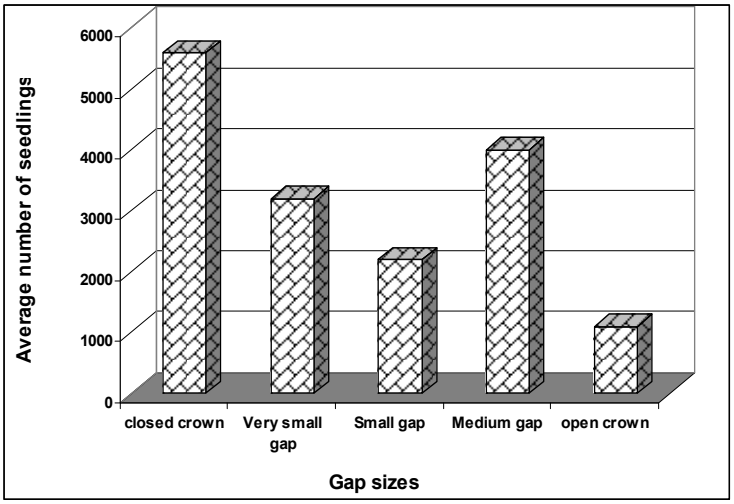

Fig. 3:Average number of seedlings under different sizes of Gaps- in study area

Figure 4 is the composing of the decay classes of dead trees effects and different sizes of gaps, according to the curve average number of seedlings under closed crown or gap with 0 area size, around dead trees with decay classes 2, is maximum, and minimum frequency related to open crown in decay class 1.

4. Data Analysis

Table 1 show the average number of seedlings in hectare that was recorded around dead trees with various decay classes and under different sizes of Gaps. Mean comparing of average frequency of seedlings, with one-way ANOVA test, was done. Variance analysis according to the data, indicated that there doesn't exist a significant difference between average number of seedlings that settle around dead trees with various

decay classes, but there is a significant difference between number of seedlings under different sizes of Gaps, around dead trees, (in 5% confidence limit).

According to the data of table 1, opening of gaps in crown of stand had a major effect as compared with effect of dead trees decay classes in settle seedlings, consequently impression of open crown is important to managing seedlings to growth up.

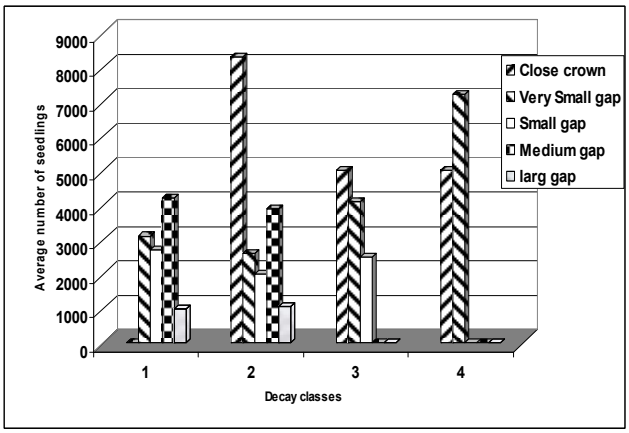

Fig. 4: Average number of seedlings in hectare around different Decay classes of dead trees under different sizes of Gaps- in study area

Table 1: Average number of seedlings around dead trees with various decay classes thatseparation in different gap sizes

Gap area sizes*					Gaps / Decay classes
Open stand crown	Medium size	Small size	Very small size	Close stand crown	
1204	4385	2803	3355	-	1
1274	3983	2033	2893	8346	2
-	-	2707	4181	5103	3
-	-	-	7361	5000	4

* sign show that the statistical difference between number of seedlings under various Gap sizes

Understanding gap dynamics can provide guidelines for uneven-aged management.

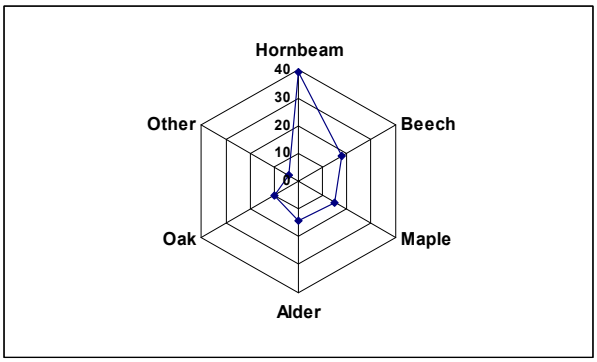

Fig. 5: percent ofAlive stand frequency in separate species

On some sites.Dead trees with creating gaps in forest crown and saving moisture and containing nutrient materials has interesting effects in settlement regeneration of forest stands.

Results of 100% inventory showed that the *Carpinusbetulus* and *Fagusorientalis* has the maximum frequency in study area respectively. In uneven aged management we should notice this matter.

5. Discussion

The concept of forests as mosaics, with shifting internal dynamics, the birth and death of patches across the landscape, and continual change and interaction, has beenin the scientific literature for more thanhalf a

century.Reduced root density and increased soil moisture indicate that belowgroundgaps are created by all aboveground gaps, regardless of gap size. Combinedwith higher temperatures in gaps, increased moisture leads to increased decompositionand higher nutrient availability, boosting the productivity of thesurrounding forest.Chance plays a major part in forest succession in gaps: gap size; within-gapposition; differences in light, moisture, temperature; plant species survival;seed rain; and diversity of materials such as downed wood within the gap allplay interacting roles in regeneration.Plant species diversity was higher in gaps than in closed-canopy areas. Some ofthis diversity results from weedy species invasion, but some comes from establishmentand growth of native forest species.According to the dead trees importance in settlement of regenerations and effective it's role, this research attempt to investigation of these effects in several dimensions. When a tree alone or in group position become drying in forest stand, after times and increasing forces of decomposers such as funguses, insects and other organisms on the tree's wood, decay level of tree or trees will increase and the Gap that was opened at first time due to tree death, over the time will decrease (Brokaw, 2000). Researches about gaps that create by dead trees need more studies, Louis investigations in 1999, showed that settlement of seedlings around nursery dead trees depend on its decay degree and moss coverage on it. Data analysis showed that number of seedlings around dead trees with closed gap was maximum, while this closed gap was open in tree mortality, at first but after times the gap closed. Lanter and Pardos studies in 2000 indicated that under small gaps, invasion of obtrusive species is low and settlement of natural regeneration is going up, therefore with increasing gap area, number of seedlings decreasing. Clinton in 1988 showed that seedlings density was significantly correlated with percent slop and positively with gap age (1-5 yr), Density varied substantially among topographic positions and increased with gap size.

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