Distribution of Dead Wood at Different Distances from Forest Roads

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Abstract

In current research, the effects of roads on dead wood (DW) distribution were studied in uneven-aged natural deciduous forest. District one of ShastKalate forestry plan, North of Iran (Golestan province) was selected with two zones around the road. Roads were randomly selected in two land units with the same site qualities and transects were established parallel with roads. Transects were divided into three zones of 15 m, 60 m and 100 m from the road edge. Data including dimensions (diameter, height or length), species, level of decay for standing dead trees, snags and lying deadwood were measured in a strip plot with a width of 20 m on transects. Results show a higher volume of standing dead trees belong to *Carpinus betulus* L. and *Parrotia persica* C.A.M ($P < 0.05$). Five decay levels were used to facilitate describing tree decays in studied zones: class A is trees with healthy trunk and without longitudinal fracture with crown decay, class B consists of trees that have lost approximately 50% of branches with diameters less than 10 cm, class C consists of trees that have lost approximately 50% of branches with diameters more than 10 cm, class D consists of trees that only their main trunk remains and class E includes trees with broken trunk beneath their crown. In the first zone of land unit I the higher volume of standing dead trees had decay level of B while standing dead trees with decay level of C and A were the highest in the second and third zones, respectively. The total volume of DW were in the form of trees with healthy trunk and without fracture but with decaying crown and with 50% fallen thin branches was the lowest in the first zone (road edge), with approximately 28 m3 ha-1. The majority of standing dead trees.

Keywords: dead trees; Snag; Felled limbs and logs, ShastKalate

Introduction and objective

Road construction in a forest area might affect forest ecosystems through several ways, for instance, by decreasing the forest productive areas, disturbing hydrology, increasing soil erosion, habitat and biodiversity loss. Forest roads are the most important infrastructure in a forest ecosystem that require forest management practices to supply all functions of forest resources. This study aims to investigate the volume and level of DW decay at different distances from forest roads. The two of distance units are located in high productivity and topography and the other is in low productivity and topography area. The findings of this research could improve DW management practices in Hyrcanian forests.

Study area

District one in ShastKalate forests, with an area of 1713 hectares, is located in Golestan province, Iran. (Figure 1)

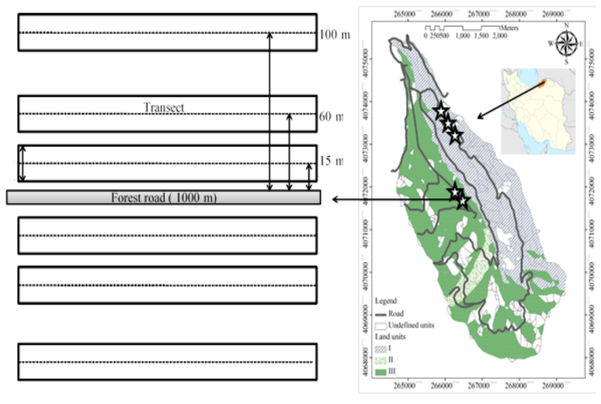

Figure 1. Sampling design in land units of study area

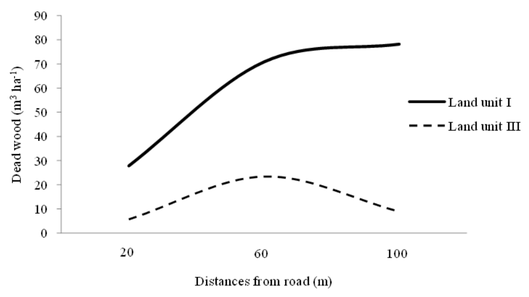

Figure 6. Distribution of DW volume in different levels of decay in land units

Table 1. Features of land units in study area

Land Units	Geology	Slope direction	Slope Steepness (%)	Stock growth (m^3 ha^{-1})
I	Conglomerate sand stone	West	10-25	>300
II	current age stream deposits	North	0-10	100-200

Table 2. Distribution of the volume of standing dead trees Carpinus betulus L in unit I

Distances (m) / Volume (m^3 ha^{-1})	Species	20	60	100
Standing dead trees	Carpinusbetulus L.	4.5 1[b]	15.13[a]	**6.13[a]**
	Total	**4.5 1**	**15.13**	**6.13**

Table 3. Distribution of the volume of standing dead trees and felled dead limbs and logs for different species in unit II

Distances (m) / Volume (m^3 ha^{-1})	Species	20	60	100
Standing dead trees	Parrotiapersica C.A.M	4.8 2[a]	8.12[b]	**1.39[b]**
	Carpinusbetulus L.	0[b]	15.11[a]	**7.13[a]**
	Total	4.8 2	23.23	**8.52**
Felled dead limbs and logs	Parrotiapersica C.A.M	0.8 5[a]	0.09[a]	**0.37[a]**
	Acer velutinumBoiss.	0[a]	0.08[a]	**0[a]**
	Total	**0.8 5**	**0.17**	**0.37**

Sampling design and field survey

- Land unit maps were investigated to evaluate variation of effective factors such as geology, slope direction, slope gradient and stock growth in DW distribution in the study area (Table 1).
- Transects were established parallel with the roads at three zones on each side of the roads with 15 m, 60 m and 100 m distances from the edge of the roads.
- Data tree species, dimensions (diameter, height or length), and decay stage were collected in strip plots on transects. All DWs were classified according to the observed level of decay

Statistical analysis

Data were statistically analyzed using the GLM procedure in SAS v 9.2 software and (Student Newman Keuls) and SNK test

Results and Discussion

Results of this study in unit I show that higher volume of standing dead trees belong to *Carpinus betulus* L. in the first and second zone ($P < 0.05$). In the third zone, a higher volume of standing dead trees was recorded for *Parrotia persica* C.A.M ($P < 0.05$; Figure 2 Table, 2). Besides, no significant difference was found among the different species in terms of felled dead limbs and logs volume in the first zone ($P > 0.05$), whereas in the second and the third zone higher volume of felled dead limbs and logs significantly belonged *to Carpinus betulus* L. and *Parrotia persica* C.A.M, respectively ($P<0.05$; Figure 3, Table,3).

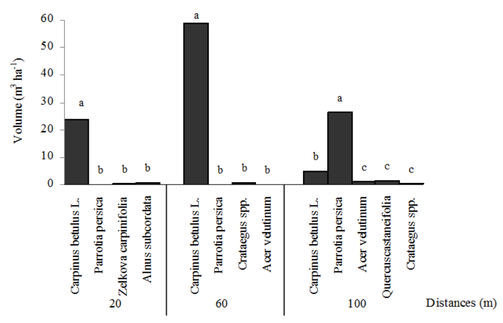

Figure 2. Distribution of the volume of standing dead trees for different species in land unit I

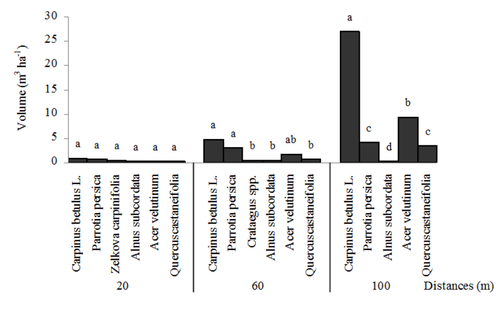

Figure 3. Distribution of felled dead limbs and logs volume for different species in land unit II

Distribution of DW volume in different levels of decay in land units

In the first zone of land unit I higher volume of standing dead trees belongs to class B. In the first zone of land unit II, higher volume of standing dead trees belongs to class A. In the second zone the higher volume of dead trees was categorized in class A and B, and in the third zone higher volume was recorded in class B (Figure 4). In the second zone the higher volume of dead trees was in class A and C, and in the third zone higher volume was recorded in class A (Figure 5).

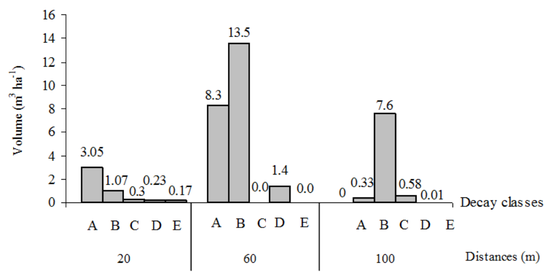

Figure 4. Distribution of standing dead trees volume in different levels of decay in land unit II

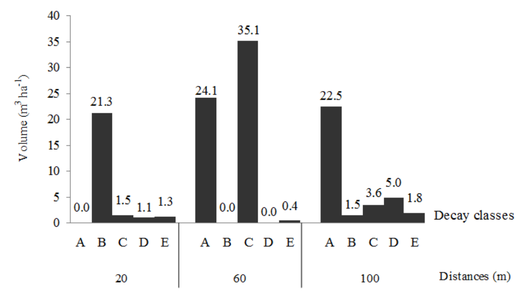

Figure 5. Distribution of standing dead trees volume in different levels of decay in land units

Distribution of DW volume at different distances from road edge

In the first zone of land unit I, the total volume of DW was the lowest at the road edge, with approximately 28 m3 ha-1. There was an obvious change in total volume of DW with distance. DW volume increased to about 71 m3 ha-1 in the second zone, but it did not change significantly in the third zone (78 m3 ha-1). This pattern was also detected in different zones of unit II except the third zone, in which DW volume declined (Figure 6).

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