Forest dynamics of broad-leaved regenerated forests in northern part of Kanto district

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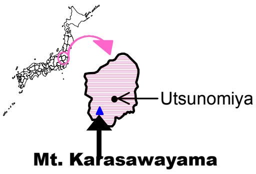
Introduction

In Japan fuel wood and litter taken from broad-leaved forests were used for living and agriculture. Because of "the fuel revolution" in 1960's, they have not been used and the forests have been unmanaged. Recently, people are interested in the forests (broad-leaved regenerated forests) as recreation areas, immediate natural environments and habitats of special plants. So it is important to manage them.

For management of broad-leaved regenerated forests it is necessary to know the stand structure and dynamics. In this study, the stand structure and dynamics were analyzed using data of stand growth.

Study site



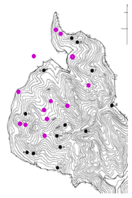
Altitude : 90-290m

Mean annual temperature : 13.8℃

Mean annual precipitation : 1,377 mm

●Number of plots : 13plots

●Plot size : 20m × 20m



●1st measurement : 1997~1998
2nd measurement : 2003
DBH, H and species were recorded for each tree with 1.2m or more height.

●There might be Japanese red pine (Pinus densiflora) forests before broad-leaved regenerated forests.

Result & Discussion

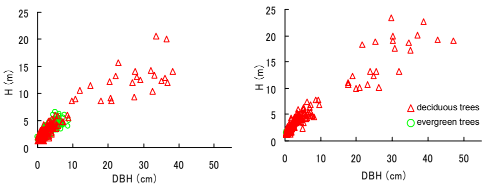
1. Stand Structure

General description of each plot

Plot no.	a	b	c	d	e	f	g
Slope direction	S20E	N20W	S10E	S10E	S50W	S	N30W
Mean slope inclination (°)	32.3	30.4	27.6	30.1	29.9	34.5	18.5
Stand density (no./ha)	1835	1472	2095	0	1931	1288	1822
Mean DBH (cm)	12.0	15.2	9.6	0.0	9.8	16.4	11.3
Mean H (m)	6.8	9.4	9.2	0.0	6.5	8.8	7.3
Stand Basal Area (m^2/ha)	35.5	43.0	21.0	0.0	19.9	44.1	31.4
Dominating species *1	*Q*	*Q*	*Pi*		*Q*	*Q*	*Q*
	A	*C*	*A*		*M*	*Pr*	*Pr*

Plot no.	h	i	j	k	l	m
Slope direction	S70W	S40W	S10W	S10E	N30W	S80W
Mean slope inclination (°)	30.8	29	33	46.2	28.8	30.9
Stand density (no./ha)	2702	1246	2179	1932	595	2640
Mean DBH (cm)	7.7	13.0	7.4	11.8	11.6	9.7
Mean H (m)	4.9	9.4	5.3	7.3	8.2	8.2
Stand Basal Area (m^2/ha)	15.3	21.8	10.3	37.1	9.6	27.7
Dominating species *1	*Pr*	*A*	*Q*	*Pr*	*Q*	*Pi*
	Q	*Q*		*Q*	*Pr*	*Q*

*1 : Dominating species : top two species of BA for trees with 10cm or more in DBH
A : Acer spp. C : Carpinus tschonoskii M : Mallotus japonicus Pi : Pinus densiflora Pr : Prunus spp. Q : Quercus Serrata



Relationship between DBH and H

plot a (left graph) facing south and plot b (right graph) facing north

○The stand structure were divided into two layers (upper layer : DBH≧10cm, lower layer : DBH<10cm)

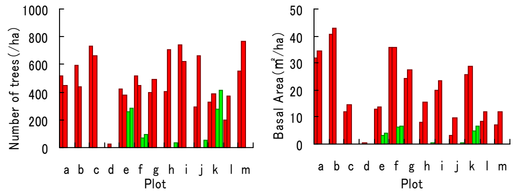
○The dominating tree species in upper layer were deciduous trees; such as *Quercus serrata*, *Prunus* spp. and so on.

○In stand facing north, the dominating tree species in lower layer were deciduous trees. However, in the other stands, they were evergreen species (*Quercus glauca, Camellia japonica, Eurya japonica*).

Many parts of mixed-species broad-leaved forests in Karasawayama were undergoing secondary succession from deciduous to evergreen forests. However, there were few evergreen trees in lower layer and forest floor of some stands facing north, and we estimated that evergreen species can not survive on northern slopes.

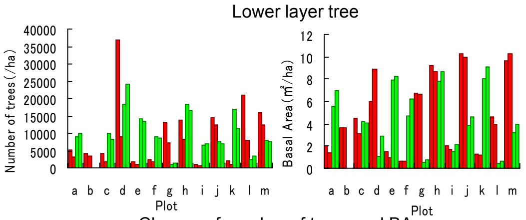
2. Stand Growth

Upper layer tree



In upper layer, basal area of deciduous trees and evergreen trees increased in all plots. Number of evergreen trees increased in all plots but number of deciduous trees increased in some plot and decreased in others.

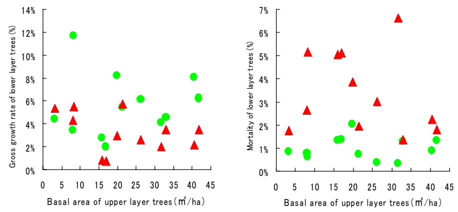
Lower layer tree



Change of number of trees and BA

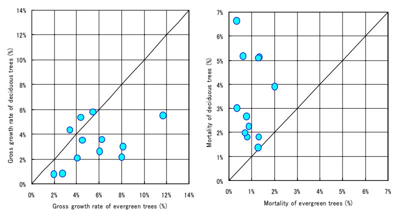
1st deciduous 2nd deciduous 1st evergreen 2nd evergreen

In upper layer, number of deciduous trees decreased in all plots. Basal area of them decreased except two plots (d and m). Number of evergreen trees decreased in some plot and decreased in others. Basal area of them increased except two plots (b and c).



Relationship between initial BA of upper layer trees and growth rate of lower layer trees

▲deciduous trees ●evergreen trees



Relationship between evergreen trees and deciduous trees on growth rate in lower layer

The relationship between initial basal area in upper layer and periodic annual increment rate of basal area in lower layer was analyzed. The upper limit of the rate of deciduous trees showed low value as high initial basal area. However, evergreen trees increment rate was not concerned with initial basal area in upper layer. The relationship between initial basal area in upper layer and mortality of deciduous and evergreen trees in lower layer could not be found, respectively.

Conclusion

Many parts of mixed-species broad-leaved forests in Mt. Karasawayama were undergoing secondary succession from deciduous to evergreen forests.
In stands facing north evergreen species can not survive.

The structure of upper layer did not change much but in lower layer evergreen trees grew gradually during this 5 years.
Growth characteristics of deciduous and evergreen trees are needed to reflect in the stand growth prediction model.