

Heterogeneous Tree-Ring Growths of *Pinus densiflora* with  
Various Topographical Characteristics in Mt. Worak

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The objective of this study was to analyze the relationship between climatic factors (monthly temperatures and precipitations) and the radial growths of *Pinus densiflora* located in different topographical sites from Mt. Worak. The growth patterns were categorized by four groups using cluster analysis from the tree-ring pattern. Cluster 1 stand has north aspect, but others south or southwest aspect. Cluster 1, cluster 2, and cluster 3 stands are located in lower elevation(305~580m), however, cluster 4 stand is located in higher elevation(450-870m). Cluster 2 and 3 stands locate at similar elevation with same aspect, however, cluster 2 stands locate on more rocky and stiff slope. The relationships between climatic factors and tree growths were analyzed by the response function method for each cluster. Cluster 1 showed positive response function from the previous November to current January in temperature and the current March in precipitation. Cluster 2 showed positive response functions mostly in precipitation and previous August and October and current March in temperature. Especially, the positive response coefficient of the May precipitation was significant( $p < 0.05$ ) and highest one. Cluster 3 showed the positive response functions from the previous October to current March in temperature, but negative from the previous December to current February in precipitation. Cluster 4 showed positive response functions mostly in precipitation and only the previous August and the current January and March in temperature.

Vegetative Regeneration in the Disturbed  
Parksil-nup Wetland, Hapchŏn

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Vegetation structure and soil properties were investigated before and after artificial disturbance of willow forest to reveal the vegetative regeneration at the Parksil-nup wetland in Hapchŏn-gun, Kyŏngsangnam-do, Korea from 1997 to 1998. The flora of the undisturbed year was composed of 125 taxa of the vascular hydrophytes and hygrophytes, and that of the disturbed year was 166 taxa, and total 207 taxa. Among 207 taxa, 82 taxa (40%) was classified as the invaders and 41 taxa (20%) as the retreaters according to Swan (1970). The biological spectra of the undisturbed and the disturbed year were same as Th-D<sub>1</sub>-R<sub>5</sub>-e according to Raunkiaer (1934) and Numata (1969). Similarity indices were CCs= 0.81 and C= 0.89, and species diversity indices (H') were 2.52 in the disturbed year and 2.45 in the undisturbed year, respectively. Sediment properties of the undisturbed and the disturbed year were pH 5.14 and 6.18, conductivity 99.64 and 70.61  $\mu\text{mho}\cdot\text{cm}^{-1}$ , organic matter 2.17 and 1.46%, total nitrogen 0.06 and 0.04%, and available phosphorus 0.15 and 0.08  $\text{mg}\cdot 100\text{g}^{-1}$ , respectively. Exchangeable cations such as calcium, magnesium, potassium and sodium were 60.33 and 58.88 ppm, 8.93 and 10.53 ppm, 4.47 and 4.68 ppm, 1.57 and 1.63 ppm, respectively. Exchangeable potassium and pH increased and the others decreased after the artificial disturbance.