

Study on Root System Distribution in a Japanese Cedar Plantation on Granite-porphry Gravel Soil

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1. INTRODUCTION

Wakayama Prefecture has experienced numerous sediment disasters. In the case of Typhoon No. 12 in 2011, heavy rain induced many hillside failures, and driftwoods intensified the damage. In view of such damage, it is important to clarify the function of tree root systems to prevent hillside failures in environmental conditions of this region. So far, there are many studies on horizontal roots concerning the function of preventing sediment collapse. But, no study in the gravel soil. In this study, the distribution of horizontal roots was observed at a test site in a Japanese Cedar (*Cryptomeria japonica*) plantation, which is widely distributed in landslide-prone areas of the Nachi River Basin.

2. OUTLINE OF THE STUDY SITE

The study site is located in a prefectural forest in the upper reaches of the Nachi River Basin, southern part of the Kii Peninsula (**Fig. 1**). The geology of the area is characterized by a lower layer which is sedimentary rock formation (alternation of sandstone and mudstone) of the Tertiary called the Kumano Group, and an upper layer which is Kumano acidic rock formation (granite-porphry).

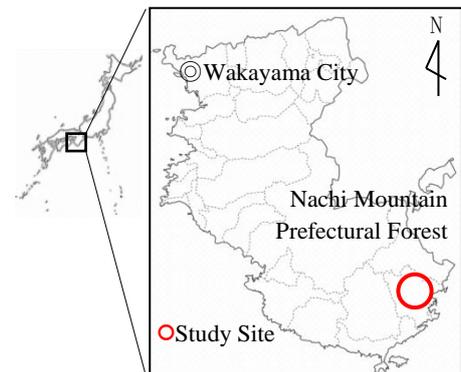


Fig.1 Location of the study

3. FIELD SURVEY

3.1 SURVEY METHOD

To start with, a block (4 m x 4 m) was selected based on the presence of multiple standing trees with different diameters (**Photo 1**). For this survey, tree properties (e.g., tree height, age) were observed for four standing trees. Outer excavation was conducted to analyse relationship between the soil structure and the roots.



Photo 1 Japanese Cedar at the

3.2 SURVEY ON DISTRIBUTION OF HORIZONTAL ROOTS (TRENCH SURVEY)

A survey on the distribution of horizontal roots was conducted at the site where the excavation referred to in 3.1 had taken place. A trench of some 1.0 m in depth and 0.6 m in width was manually dug and the location and diameter of each root exposed along the vertical profile were recorded in a grid with a 0.25m pitch (**Photo 2, Fig. 2**).

4. STUDY FINDINGS

The study results confirmed the presence of gravel soil and base rock (granite- porphyry) under a thin top soil layer (Fig. 2). This gravel soil contains many boulders of 50 cm in diameter and larger. It was confirmed that vertical roots do not reach the base rock, presumably because such boulders have hampered the growth of roots. While a large number of horizontal roots are observed in the soil formation, the number tends to decline in accordance with the vertical depth. When the roots observed in each profile are sorted in terms of diameter, the diameter of 60% of the total number of roots is less than 2 mm. The roots whose diameters are 2 mm or less were seen the most at the depth of 20 cm or less below the ground surface and the number decreases as the depth increases. The number of roots of 2 mm in diameter or larger is the highest at the depth between 20 cm and 39 cm below the ground surface.

5. CONCLUSIONS

The study results, In the case of trees growing above the gravel soil containing much larger granite-porphry gravel than ordinary forest soil, many roots stretch between boulders or are bent because of such boulders. The next step of the study will be to conduct a more detailed analysis of the data obtained in this study to establish the relation between the growth of the root system and diameter as well as age of the tree so that the implications of the growth of the root system on the planting density as well as thinning of trees can be examined.

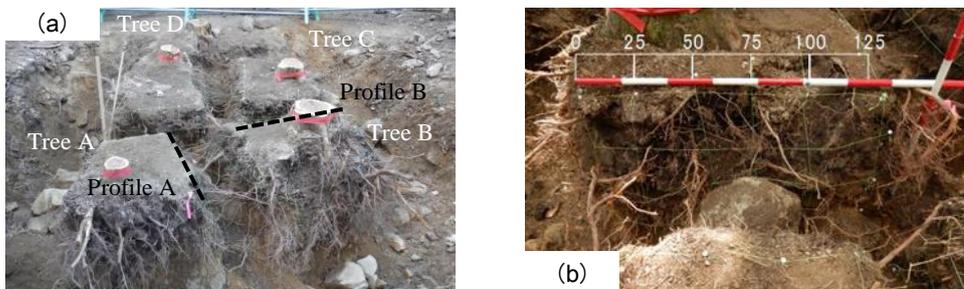


Photo 2 Three post-excitation states of the site

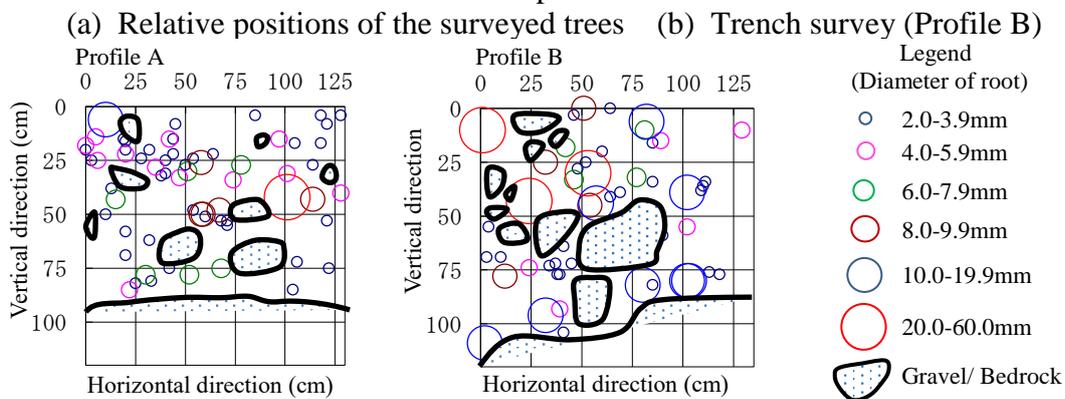


Fig.2 Relation between roots and gravels in each profile

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