

Status of Sediment Dynamics in Lake Takkobu of the Kushiro Mire, Japan, Associated with Forestry and Agricultural Development in the Watershed¹

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ABSTRACT

Fine sediment loadings from agricultural watersheds have led to habitat degradation in Lake Takkobu, northern Japan. Fifteen lake sediment core samples were obtained and analyzed to develop a chronology using physical sediment characters, ¹³⁷Cs, and tephra. The reconstructed sedimentation rates over the past ca 300 years suggested that sedimentation rates increased drastically after land use development. With a natural sedimentation rate of 0.1-1.1 mm year⁻¹ until 1898, lake sedimentation accelerated to 0.6-12.8 mm year⁻¹ after 1898. The sedimentation rates after land use change, such as forestry, river engineering works, and agricultural development, were about 6-12 times higher than that under natural conditions, leading to accelerated lake shallowing over the last ca 100 years. Sedimentation rates between 1898 and 1963 differed with location in the lake because of spatial variation in the sediment flux from the contributing rivers and their watersheds. The sedimentation rate in the southern zone between 1898 and 1963 was significantly higher than that in the middle and northern zones, reflecting active sediment production associated with forestry for charcoal production and canal construction for transportation in the southern watersheds and wetlands. The sedimentation rate after 1963 did not vary among the three zones, because decreasing sedimentation was found in most of the southern sites whereas an increasing trend was observed in the middle and northern sites. This result can be explained by shallowing of lake-bottom morphology with sedimentation and the resultant reduction of sediment retention capacity in the southern zone. Moreover, the sedimentation rate at sampling sites close to river mouths increased by 5-32 times compared with natural rates before 1898. The Kushiro River, into which Lake Takkobu drains under regular flow conditions, further contributed to an increased sedimentation rate, because water from the Kushiro River flows back into Lake Takkobu during floods.

Keywords : *Deforestation, Agricultural land, Sedimentation rate, Lake shallowing, Kushiro Mire*

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