Form 2

Dissertation Abstract

Report no.	(Course-based) No. 1042	Name	HENEGAMA LIYANAGE KELUM SANJAYA
Dissertation title	THE INFLUENCE OF SEDIMENT DEPOSITION AND EROSION PROCESSES ON THE COLONIZATION OF RIPARIAN VEGETATION IN MIDDLE RIVER REACHES (河川中流部における河岸植生の繁茂に対する土砂の堆積及び洗掘の影響)		

Riparian ecosystems are hot spots of biodiversity and distinct from the adjacent terrestrial habitats. The nature of the flood level, frequency, duration of flood and the interactions among the ecological units of the riparian ecosystem play a key role in its stability and conservation. In addition, erosion and deposition process is important in shaping the riparian ecosystem. As it is distinct from the adjacent terrestrial ecosystem, the riparian zone makes home for a variety of fauna and flora with unique features. While studies report the degradation of riparian ecosystem with the intervention of anthropogenic activities in other parts of the world, many of the Japanese rivers have been severely invaded by thick vegetation cover compared to five decades before. Studies have thrived to understand the reason behind this to implement the possible management strategies. However, the reason is not yet clear. In comparison to the 1950s, the aerial photos show a prominent river channel incision, indicating the lack of gravelly sediment in river channels. The river gravel mining was the major source of construction material in the 1960s, though it is prohibited nowadays. Therefore, in the present study, we hypothesized that the shortage of gravelly sediment may play a major role in excessive vegetation encroachment in Japanese Rivers. We employed several strategies to test the hypothesis such as aerial photo survey, field data and numerical modeling the vegetation colonization delay. Hourly flood level data were obtained from MLIT, Japan for the period of the analysis. Contiguous aerial photos obtained before and after the floods in five selected rivers, namely; Arakaw River, Sagami River, Kuzuryu River, Karasu River (Gravelly rivers), Hii River and Kizu River (Fine sediment rivers) were analyzed to identify the erosion and depositions. Then the time that it takes to appear the herbs and trees were estimated as the colonization delay. The reported field investigated data were used to support the observed results conducted at Arakaw River, Kumagaya Sandbar and Karasu River after depositions and erosions. The observed results showed that the herb colonization delayed about 3-4 years in the gravelly sediment deposited locations, whereas the delay was 1-2 years at the eroded locations and fine sediment rivers. Similarly the tree colonization was delayed by 6-7 years on the deposited locations, while the delay was 3-4 years on eroded sites and fine sediment rivers. The DRIPVEM was validated in selected rivers before the use for simulating the vegetation colonization delay. By limiting the nutrients and moisture for herbs and trees respectively, a fair agreement was able to obtain for observed herb and tree colonization delay. The vegetation cover was simulated with the influences by flood levels, deposited area fraction, soil particle size and total nitrogen. This demonstrated that the deposition of gravel sediment suppressed the vegetation colonization in riparian zone. The cleansed gravelly sediment by flood is lack of nutrients when deposit. Moreover, the ability to retain the moisture on gravelly sediment is weak. The herbs need relatively higher amount of nutrients to begin the colonization compared to trees. The trees need higher amounts of moisture during the germination. These limiting factors on gravelly sediments resist the vegetation colonization until the atmospheric nitrogen add sufficient nutrient that takes certain time. The afforestation of river basins, construction of large dams and constructing check dams along the tributaries have cut off the gravel supply to the downstream; hence the reduction of gravel sediment by gravel mining in the 1960s has not been compensated yet. Together the above facts, the observed and the simulated results supported our hypothesis; the gravelly sediment shortage may have been one of the greatest influences on excessive vegetation colonization in Japanese rivers.