

Study on the distribution and dispersal method of soil seedbank to bare bar on sand bed river

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To further study the distribution of soil seedbank and its relationship with hydrology and river morphology, field survey of soil sampling and morphology were conducted in both river margin and sandbar. The field survey results show that the strong interaction of hydrology and morphology on the distribution of seeds in soil seedbank. Hydrochory is thought to be the dominant vector for seed dispersal to shoreline. And wind is likely the significant seed dispersal approach to the flat area of sandbar and the dunes on sandbar under the condition of slight water fluctuation.

1. INTRODUCTION

The dynamics of riparian vegetation can not only affect the flood management but also the ecological balance (Toda et al. (2005)). The first stage for the dynamics of riparian vegetation is the seed transportation by dispersal, and then, deposits into the soil seedbank (Nathan et al. (2000)). The second dispersal, such as hydrochory and wind, has been reported to be the main factor on the formation of soil seedbank (Soomers et al. (2013)), and it may be influenced by the hydrological, the morphological variables, and the condition of ground surface.

The studies referred above for the distribution of soil seedbank and the seed dispersal to river channel are mainly focused on the relative large flood and river margin, studies on different flow regimes and the rough ground surface (such as dunes) are limited. In this study, one sand-river (Suzuka River, Mie prefecture, Japan) was selected as a target research site to explore the distribution characteristic of soil seedbank and to deduce the possible approach of the seed dispersal to the river margin and the sandbar under different flow regimes.

2. METHODS

The field survey was conducted at the shoreline, the flat area of sandbar after the moderate flood (Oct.12, 2017), the large flood (Nov.9, 2017) and around the ordinary river flow (Dec.11, 2017 and Jan.12, 2018). The investigation of dunes was conducted after the large flood, which resulted in the formation of dunes, and around the ordinary flow. The specific investigation object and the corresponding method are shown as Fig.1.

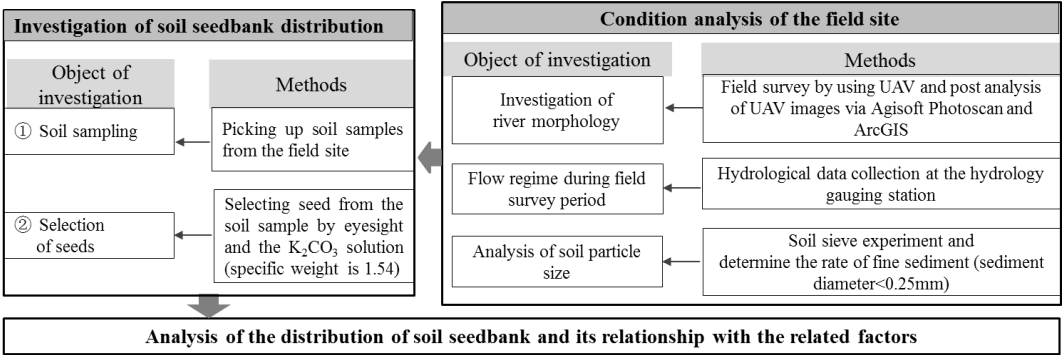


Fig.1 Object of field survey and the corresponding method

3. RESULTS AND DISCUSSION

Keywords: Soil seedbank, Shoreline, Flat area of sandbar, Dune, Hydrochory, Wind dispersal

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The seed density, change of morphology and rate of fine sediment at different field surveys are listed as **Fig.2 to Fig.5**.

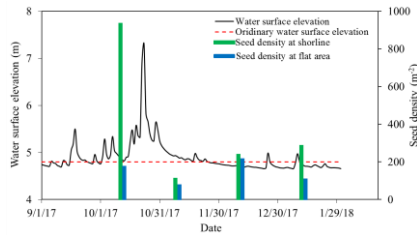


Fig.2 Seed density at shoreline, flat area and hydrograph

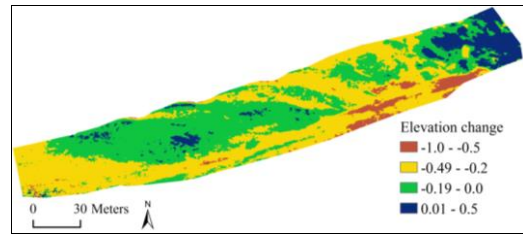


Fig.3 Change of river morphology after the large flood

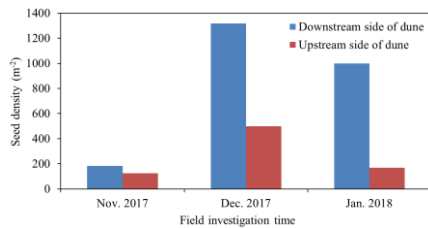


Fig.4 Seed density at dunes

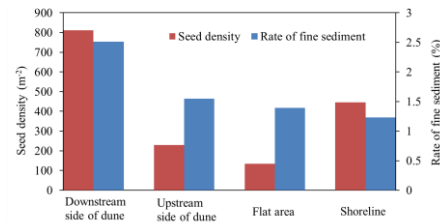


Fig.5 Relationship between seed density and rate of fine sediment

3.1 Relationship between hydrology, morphology and the distribution of soil seedbank

The seed density at the shoreline is tightly related to the change of flow regime (**Fig.2**), and the moderate water level fluctuation seems to be the most favorable condition for seed dispersal and deposition since the seed density was highest. And the seeds after the large flood at shoreline are lowest; this might be caused by the serious erosion of river bed (**Fig.3**), especially at the shoreline and the upstream of river channel.

The analysis of soil seedbank at dunes was separated from the ordinary analysis (shoreline and flat area) since dune on sandbar is a special topography with its elevation difference of the upstream and the downstream. The seed density at the shoreline is higher than it at the flat area of dune (**Fig.2**), and the seed density and the rate of fine sediment at the downstream side of dune is much higher than it at the upstream side (**Fig.4** and **Fig.5**). The possible reason is that the shoreline with high frequency of inundation has advantage to accumulate seeds. The elevation difference of dune may also promote seeds deposition.

3.2 The approach of seed dispersal

Hydrochory is thought to be the significant seed dispersal method for the shoreline since the strong dependence of seed distribution on the fluctuation of water level. As flow cannot reach sandbar under slight flow fluctuation and the animal is not sensitive to the elevation difference, therefore the alteration of seeds on sandbar may be dispersed by the wind.

4. CONCLUSION

The seed density at shoreline is higher than it at the flat area, and the seed density and rate of fine sediment at the downstream side of dune is much higher than it at the upstream side of dune. Hydrology is likely the dominant seed dispersal method to shoreline, and wind seems the significant dispersal method to the flat area and dunes of sandbar.

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