

Sediment accumulation and national heritage: the Chantilly case study

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Introduction: The domain of Chantilly (Oise, France) includes a castle and a garden, both dating from the XVIIIth century that are today seen as an important heritage of France's history. Nowadays, the 2.5-km long canal that run through the domain is subject to the phenomenon of silting leading to the accumulation of sediments within the canal and linked to the proliferation of algae that have a dissuasive effect among tourists. This study aims at presenting the geo-environment of the Nonette catchment in relation to sediment availability and providing the local stakeholders with a model of the sediment accumulation within the canal.

Methods: Geomatics and literature review are the base of Nonette catchment environment's presentation; the incorporation of geology (Fig. 1), geomorphology, hydrology, erosion and land use has permitted to highlight the sediment transport context occurring upstream of Chantilly domain. As for the model of sediment accumulation showed in this study, it has been performed using HEC-RAS model [1]. This model is widely used in the literature tackling sediment transport and accumulation and allows to forecast what stretch of the canal is most susceptible to an accumulation of sediment likely to have an impact on the activities offered to tourists (and therefore an impact on the Domain economy).

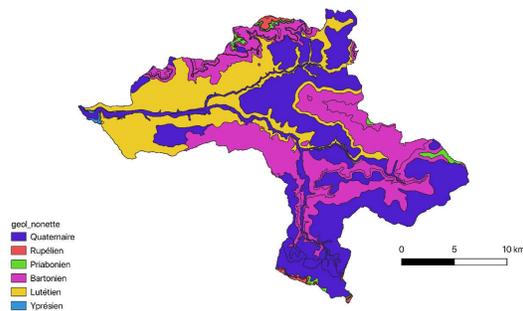


Fig. 1: Geological map of Nonette catchment, Oise.

Results: This study shows that headwaters catchments within Nonette catchment show predispositions to erosion and enhancement of sediment transport likely to reach the river and propagate along the fluvial network (and eventually reach Chantilly Domain's canal. HEC-RAS model highlights an accumulation of sediment near the entrance of the Nonette stream into the canal and a propagation through the canal, in such a quantity it confirms what caretakers and tourists observed and complained about. The total accumulated volume

assessed by the model between 2001 and 2010 equals 3901 m³ (Fig. 2).

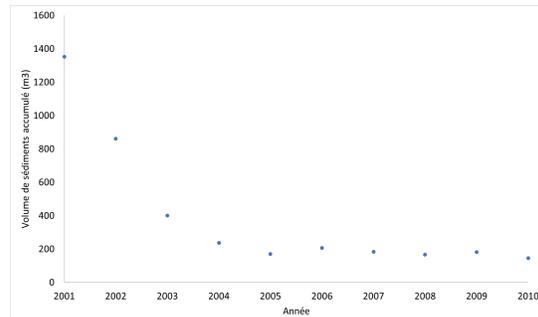


Fig. 2: Annual volumes of sediment accumulated in the Grand Canal assessed by the simulation of 10 years functioning of the system.

Discussion: Assessing sediment accumulation through HEC-RAS modelling allows to estimate sediment excess and pinpoint stretches of the canal that need caring (dredging) if touristic activities are to remain. However, the volumes determined are underestimated as matter brought by vegetation or other systems different from the river (e.g.: wind, rainfall) is not considered in the calculation. The quantity of sediment is also subject to uncertainties as the bathymetry of the canal is not available.

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References: [1] Brunner G. W. (2016) – HEC-RAS, River analysis system user's manual version 5.0. Institute of Water Resources, Hydrological Engineering Center Davis.