First Feedbacks on Restored Floodplain Lakes Sedimentation along the Rhône River

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Sedimentation rates and processes were studied in eighteen restored floodplain lakes and channels of the Rhône River in south-eastern France. Whilst many authors have studied the sedimentation in former channels before restoration, little is known about post-restoration sedimentation rates and processes since these are only now becoming evident. The objective of study was therefore to evaluate the variability in post-restoration habitat conditions inside of floodplain lakes (inter-lake comparison) and to consider the temporal evolution of habitat conditions. The increase of the minimum discharge in the old Rhône channel and the removal of sediments in the floodplain lakes were the main issues of the Rhône River restoration project. In addition, the minimum discharge increase resulted in a higher water-table in the former Rhône channel. The sediment survey protocol was established and three steps were implemented: i) the measurement of the sedimentation rates based on the ratio between the mean sediment thickness and the time since the restoration works; ii) determination of connection discharge by piezometers and precise DGPS survey and iii) the statistical analysis of the relationships and inter-lake analysis (the characterization of connection frequency and to define the life expectancy of former channels). Changes in the connectivity between the main channel and other aquatic zones also influence the change in sedimentation rate through time. Multiple parameters such as age, channel geometry, mean annual sediment supply and frequency of connection, groundwater connection with the main channel and the type of sediments (sand, clay, silt, gravel) are included. The variability is in the inter-lakes function of restored reaches along the length of the Rhone corridor.

Three hydro-geomorphological groups can be identified:
1. Systems characterized by rapid flows and the transport of sand and fine sediment (YEN, LUI, CIS)
2. Systems characterized by a wide range of sediment sizes, from sand to silt (BRO, MOI, LUC, GRA, CER, JAR,TAB, etc.). This cateogory can be sub-divided into two groups of lakes : those that generally experience slower flows, and those that experience sedimentation in the absence of flow (for example, TAB)
3. Systems that demonstrate homogeneous sedimentation along the length of the sections (MAL, BEA, CHA, MOL, ILO, NOY, SAI, ARC)

Some of these systems provide evidence that variation in flow and sedimentation is not correlated to the frequency of reconnection to main channel. Floodplain lakes that record an accumulation of silt can be rarely submerged; it means that feedback between physico-biological informations can be interesting. Sedimentation depth, spatial distribution, topography, hydrological connectivity and age of former channels were both measured and calculated. The mean sedimentation rate of all former channels studied varied between 0 and 7 cm.yr-1(for the third year after restoration). Restored former channel habitats have not previously been categorised by the type of function for Rhône River.

Key words: sedimentation, floodplain lake, Rhône River, river restoration