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Relationships between channel mobility, hydro-geomorphic pattern in floodplain forest and vegetation characteristics (diversity, structure and growth): Ain River, France.

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Since the 1970's, numerous studies have demonstrated that spatial complexity and biological diversity in a fluvial corridor is controlled by channel mobility, sediment erosion and deposition and inundation pattern. Contrasted stationary conditions in this mosaic can be related to significant differences in terms of vegetation repartition and dynamics. But only a few studies have been conducted at a detailed scale to quantify the impact of fluvial dynamics on riparian vegetation focusing on a widely extending vegetation unit that has undergone different hydro-sedimentary conditions.

In this study, we analyse the influence of vertical bed mobility (incision / aggradation) on hydrological and sedimentary conditions but also on vegetation, taking into account the understory strata (floristic composition, community structure and specific diversity) and ligneous vegetation (tree growth). Three hypotheses are tested:

H1: vertical bed mobility creates different conditions in terms of hydrological connection, and thus in terms of disturbance and water availability: incised reaches are considered to be less connected and disturbed than aggraded ones.

H2: differences in water availability influence tree growth: the radial growth is expected to be lower in incised reaches than in aggraded ones.

H3: differences in disturbance regimes affect understory community composition and diversity: the community in more disturbed plots is expected to be more diversified, variable and dominated by species adapted to disturbance.

In the lower valley of the Ain River (6^{th} order gravel bed river with a mean annual

discharge of 120 $m^3.sec^{-1}$), we have selected 20 forested plots located in incised and aggraded reaches (10 for each context) by using longitudinal profile historical comparison and vertical aerial photography. The twenty plots have been selected following a field reconnaissance and have a strong homogeneity in term of overstory vegetation characteristics. The study focused on mesophitic forested units about 45-years-old dominated by post pioneer species (particularly *Fraxinus excelsior*) with few old *Populus nigra*.

The effects of bed vertical mobility on hydro-morphological conditions in flooded forested plots have been studied by topographic measurements, hydrological and flood event survey (maximum flood and data records) and sediment analysis. A dendrochronological approach has been used to evaluate the response of tree growth. The impact of disturbance regimes on understory vegetation has been studied by a synchronic comparison of 40 quadrats (16 m^2) that underwent high flood frequency (aggraded reaches) with 40 other ones in incised reaches (low flood frequency).

As expected, vertical bed mobility changes relative floodplain topographic position, and therefore hydrological connection and sedimentation dynamics (H1).

Over a five-decade period the mean growth in both contexts is comparable. But, for the last 10 years, sites in incised reaches show a significant decoupling growth pattern from more connected sites. The radial increments are smaller, probably due to a hydrological threshold effect (H2).

Difference in disturbance regime is recorded by understory vegetation. In more disturbed plots, these vegetation is specific, more diversified, more variable and with a higher frequency of post pioneer tree seedling (H3).

As a consequence, apparently similar forest patches in terms of composition and structure of dominant tree species undergo different ecological trajectories according to the hydro-morphological context of the reach. In fact, slight differences in hydro-sedimentary conditions within the floodplain can affect the characteristics of the riparian vegetation. Thus, floodplain forests management must take into account not only the current hydrological connection context of the patches but also the evolution of this connection. One of the challenges is to better integrate, in the forest management and forestry planning, the channel behaviour and in particular the bedload transport and the water levels.