[CLS]Alteration of nitrous oxide emissions from floodplain soils by aggregate size, litter accumulation and plant – soil interactions Semi - terrestrial soils such as floodplain soils are considered potential hot spots of nitrous oxide (N2O) emissions. Microhabitats in the soil – such as within and outside of aggregates, in the detritusphere, and / or in the rhizosphere – are considered to promote and preserve specific redox conditions. Yet our understanding of the relative effects of such microhabitats and their interactions on N2O production and consumption in soils is still incomplete. Therefore, we assessed the effect of aggregate size, buried leaf litter, and plant – soil interactions on the occurrence of enhanced N2O emissions under simulated flooding / drying conditions in a mesocosm experiment. We used two model soils with equivalent structure and texture, comprising macroaggregates (4000 – 250 [UNK]) or microaggregates (< 250 [UNK]) from a N - rich floodplain soil. These model soils were planted with basket willow (Salix viminalis L.), mixed with leaf litter or left unamended. After 48 h of flooding, a period of enhanced N2O emissions occurred in all treatments. The unamended model soils with macroaggregates emitted significantly more N2O during this period than those with microaggregates. Litter addition modulated the temporal pattern of the N2O emission, leading to short - term peaks of high N2O fluxes at the beginning of the period of enhanced N2O emission. The presence of S. viminalis strongly suppressed the N2O emission from the macroaggregate model soil, masking any aggregate - size effect. Integration of the flux data with data on soil bulk density, moisture, redox potential and soil solution composition suggest that macroaggregates provided more favourable conditions for spatially coupled nitrification – denitrification, which are particularly conducive to net N2O production. The local increase in organic carbon in the detritusphere appears to first stimulate N2O emissions; but ultimately, respiration of the surplus organic matter shifts the system towards redox conditions where N2O reduction to N2 dominates. Similarly, the low emission rates in the planted soils can be best explained by root exudation of low - molecular - weight organic substances supporting complete denitrification in the anoxic zones, but also by the inhibition of denitrification in the zone, where rhizosphere aeration takes place. Together, our experiments highlight the importance[SEP]