*Symposium for European Freshwater Sciences 13*

**Riparian vegetation mitigates river warming: exploring its large scale effects on past and future thermal regimes**

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**Abstract type:** oral

**Appropriate sessions** (by preference order):

RS13. Climate change and freshwaters: challenges and solutions

RS11. Restoration, conservation and management of freshwater systems

SS05. Freshwater Macroecology research and perspectives

**Abstract *– 250 words max.***

As air temperature increases worldwide due to climate change, stream temperature (Tw) is expected to follow a similar trajectory with even faster changes. In this study, we aimed at investigating and quantifying the extent to which riparian shading can help mitigate river warming at a large scale (105 km²). To do so, a physical process-based thermal model coupled with a semi-distributed hydrological model was used to reconstruct (1963-2019) and project (2005-2100) Tw for 52000 hydrographic sections of the Loire basin (France). This high spatial resolution (1 km) model includes a novel routine to account for riparian shading dynamically across seasons. Results showed that past and future increases in Tw were greater in relatively large rivers (Strahler order≥5), which was attributed partly to the mitigation effect of riparian shading observed on smaller streams. Indeed, riparian vegetation shading mitigated spring and summer Tw increases by up to 0.16°C per decade in headwater streams (i.e. < 30 km from the source) over the past six decades. Moreover, riparian shading could mitigate the future increase in summer Tw in small streams by 3.75°C to 5.17°C by the end of the 21st century, depending on the climate model and scenario from sparsely shaded reaches to highly shaded reaches. We complemented these results by exploring the consequences of theoretical scenarios of large-scale riparian restoration or loss on Tw changes. Our results suggest that the restoration and maintenance of riparian forests holds great promise to help mitigate the effects of global warming on rivers and their biodiversity.