

USING GAUGING NETWORK FOR REGIONAL MONITORING OF STREAM WATER TEMPERATURE (WALLONIA, BELGIUM)

Utilisation d'un réseau de stations de jaugeage pour le monitoring régional de la température des cours d'eau (Wallonie, Belgique)

Introduction

Context

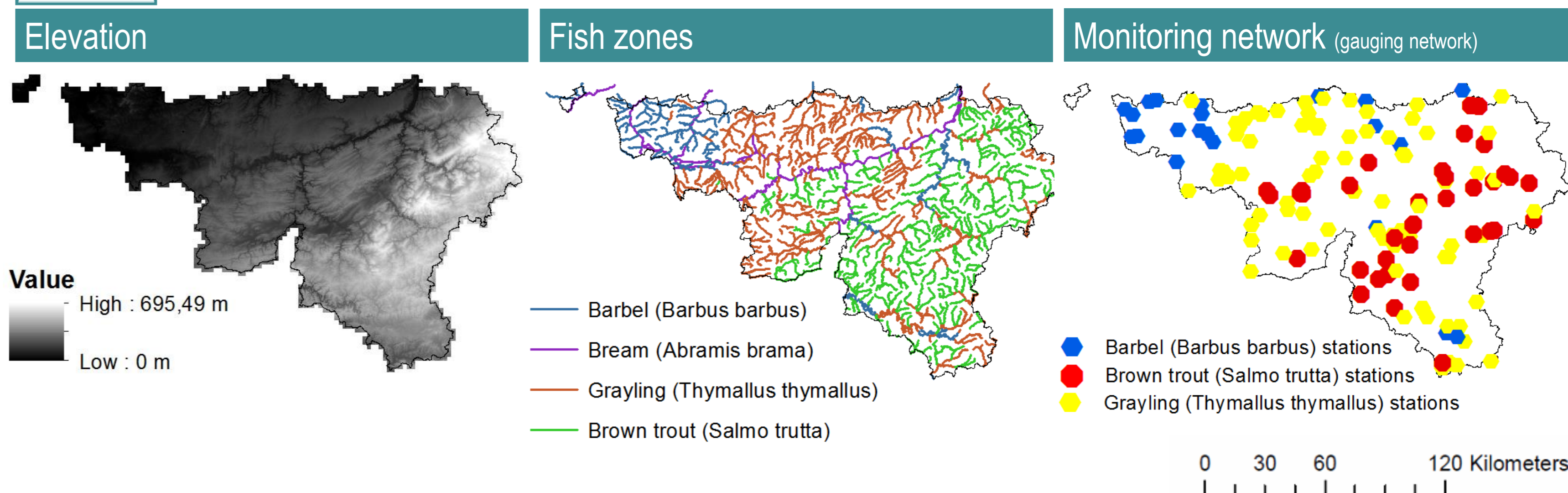
- « Water temperature: the ecological master factor » J.R. Brett (1971)¹
- How to effectively monitor water temperature?
 - Water temperature monitoring network (e.g. water framework monitoring)
 - Potential of ancillary data source like gauging network?
- How can river managers take into account water temperature (e.g. riparian shade management)?

Objectives

- Evaluate the potential of gauging network for stream water temperature monitoring
- Characterize the thermal regime at the river network scale, focusing on the thermal requirements of the brown trout (*Salmo trutta fario*)
- Quantify the impact of environmental parameters on water hot thermal episode

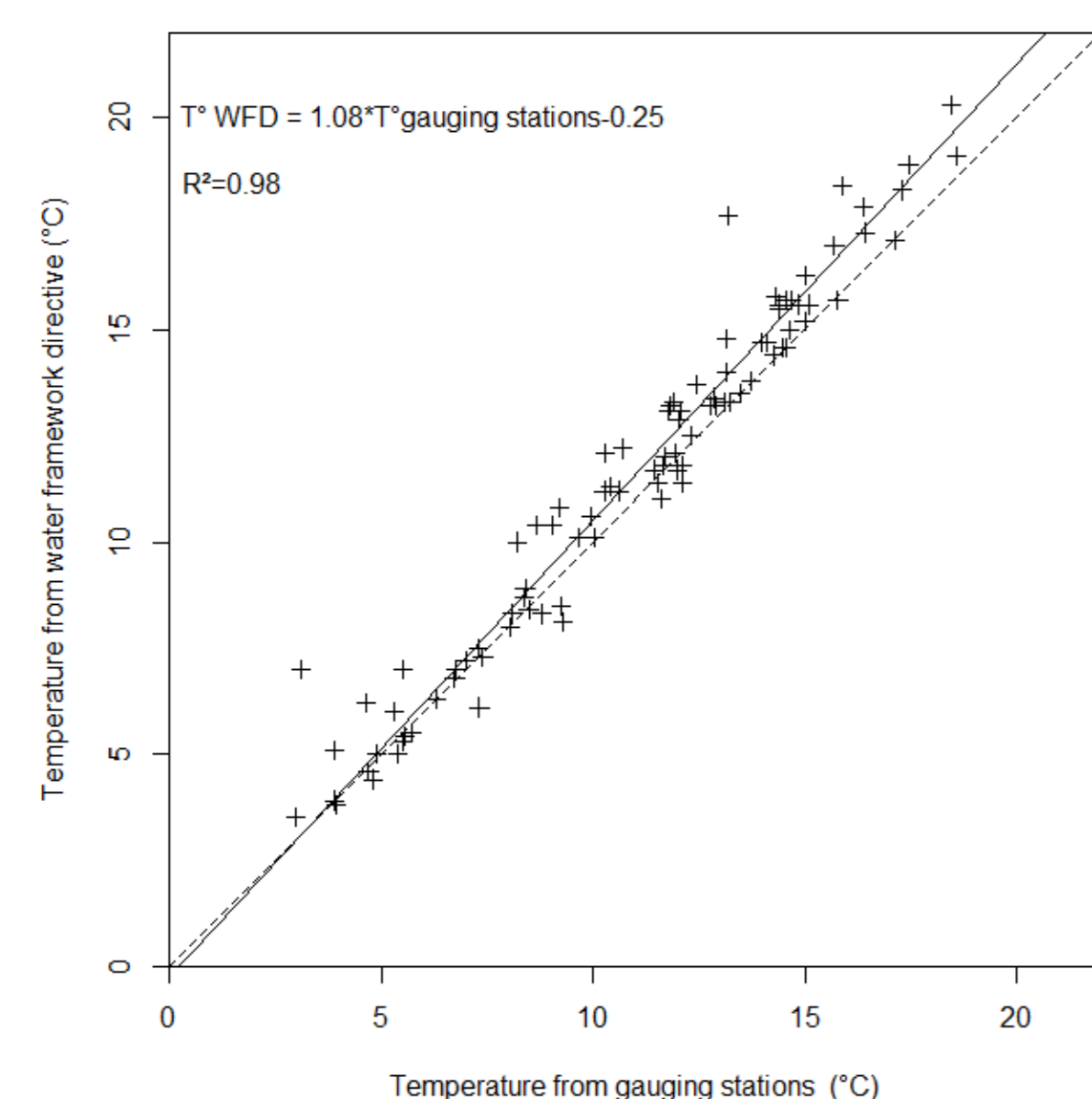
Material & methods

- 140 stations (1obs./10min) / 2012 – 2016
- Drainage area: 60% of study area
- Wallonia (Southern Belgium): 16.000 km²
- Non navigable rivers of Wallonia (< 1km²)



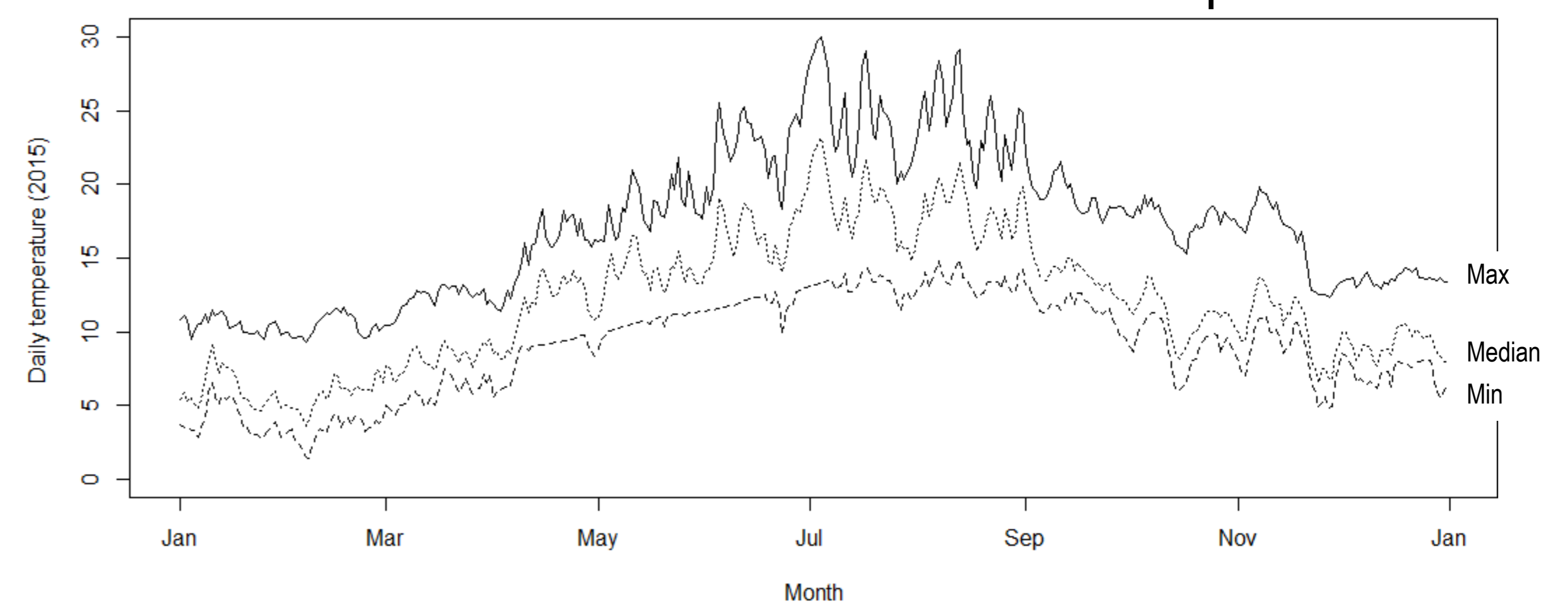
Results and discussion

A. Gauging network for temperature monitoring?



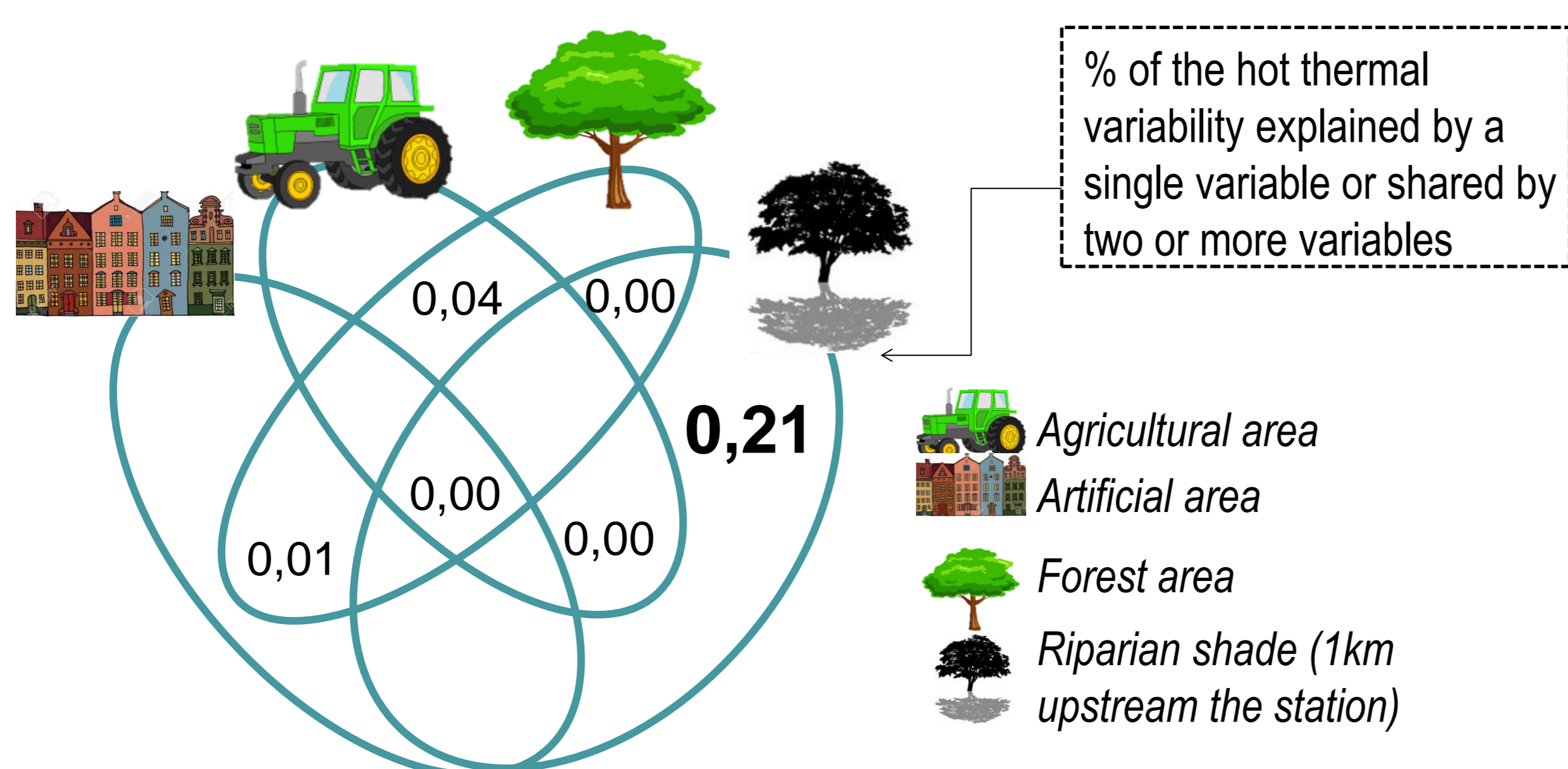
- Continuous temperature data from the gauging network can be used and are relevant for water temperature monitoring
- The difference between the measurements of the two networks is not to a temporal drift, the river size, the elevation

B. Characterization of stream water temperature



- Sinusoidal trend
- 0.1°C (7/02/2015) to 29.9°C (4/07/2015)
- Important daily variability over the network
- Intra-year thermal variability

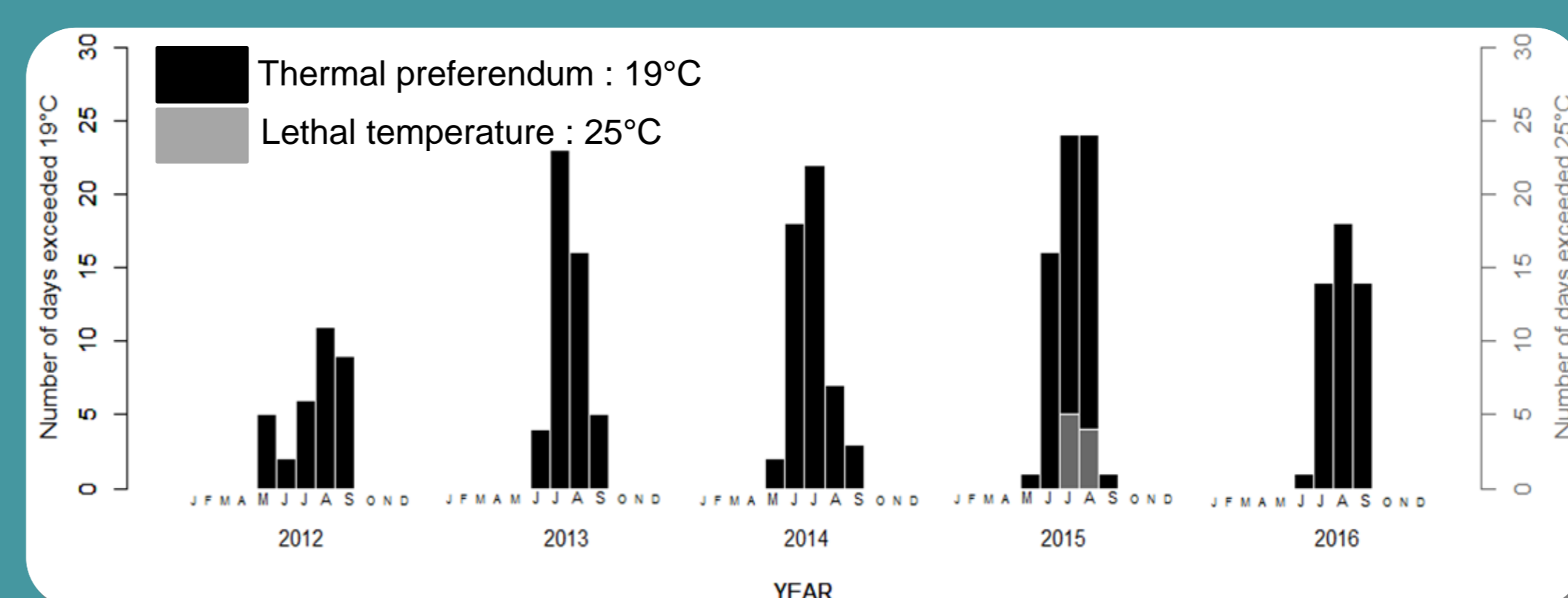
C. Which environmental parameters most influence annual hot thermal episode?



- Hot thermal episode = percentile 95 temperature of the 7 hottest days
- 4 variables most correlated with hot thermal episode
- Riparian shade explains a large part of the hot thermal variability: **21%**

APPLICATION

What about temperature for *Salmo trutta fario* ?



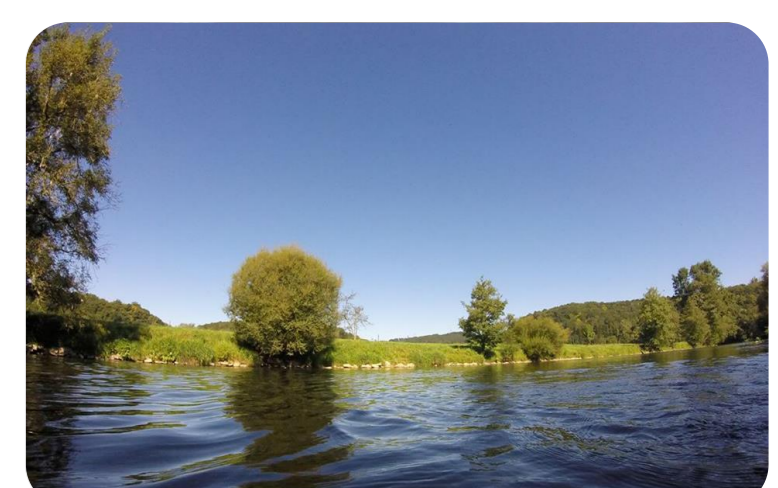
- Exceedances occur between May and September
- Max 25 days/month above thermal preferendum
- Lethal temperature only occurred in 2015

Thermal sensitive species

Umbrella species

Perspectives

- Improve understanding of environmental parameters (land cover, shade, slope, air temperature...) that regulate stream water temperature
- Use infrared thermal images acquired from drones to have spatially continuous mapping of stream water temperatures (for a hot thermal episode)
- Develop decision making tools for river managers (e.g.: define target river reaches for riparian forest restoration)



¹Brett J.R., 1971. *Energetic responses of salmon to temperature. A study of some thermal relations in the physiology and freshwater ecology of sockeye salmon (Oncorhynchus nerka)*. Amer Zool 11:99–113.