



Linking riparian forest structure and fluvio-morphological characteristics in a gravel-bed river (Piave river-Italian alps)



Vitti P.¹, Picco L.¹, Mao L.², Sitzia T.¹, Comiti F.², Rigon E.¹ & Lenzi M.A.¹

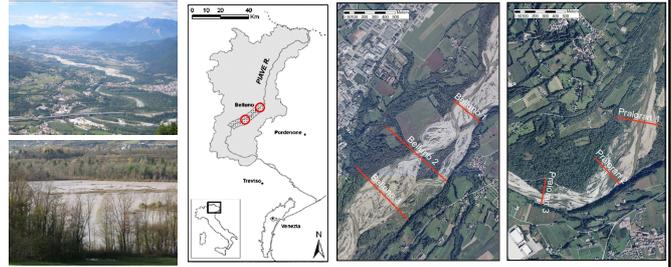
¹ Department of Land and Agroforest Environments, University of Padova (Italy)
² Faculty of Science and Technology, Free University of Bozen-Bolzano (Italy)

INTRODUCTION

Riparian vegetation pattern in gravel bed rivers depends on the hydrological regime and the morphological settings of the river. However, the marked spatial variability of density, height, species diversity, age, and rates of growth reflects the very complex nature of bed colonization, the strong influence of sequences and magnitude of floods, and the feedbacks between morphology, vegetation and hydraulics. The aim of the work is to analyze the relationship between the vegetation structure and the morphological characteristics of two sub-reaches of the Piave river.

STUDY AREA

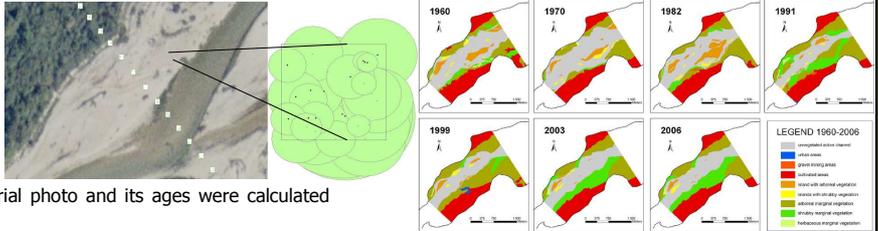
The Piave basin (222 km long, 4500 km² as basin area) lies in the eastern Italian Alps. The climate is temperate-humid with an average annual precipitation of about 1350 mm. The two study reaches are ~1 km long and are located in the middle portion of the river course (drainage area 3180 km²). The morphology of the river in the study reaches is dominated by braided and wandering channel patterns, the slope is around 0.45%, and the D₅₀ ranges between 20 and 50 mm. The Piave River has suffered intense and multiple human impacts, especially due to dam building and in-channel gravel mining. The present channel morphology of the lowest segment is the result of adjustments (narrowing and incision) occurred in response to human interventions.



METHODS

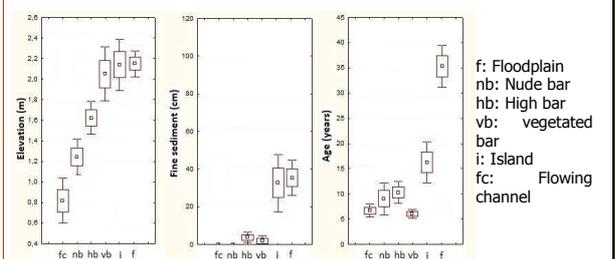
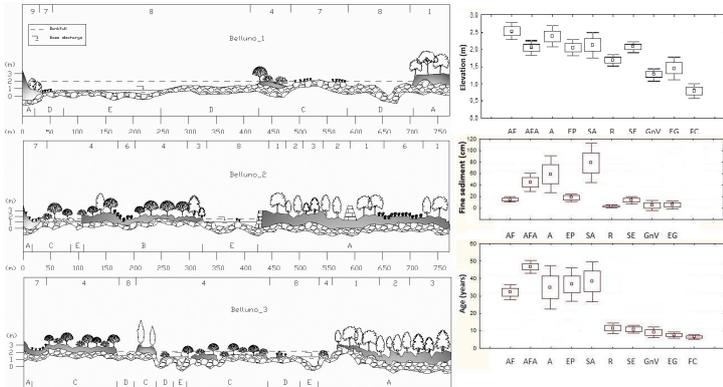
Six cross-sections were surveyed, and vegetation and soil variables were measured (4x4 m plots 10m spaced):

- Canopy cover (%) and plant community;
- Diameter, height, canopy size, species of each tree;
- Number of herbaceous species;
- Thickness of fine layer and GSD of coarse sediments.



Each vegetation plot were recognized on a recent aerial photo and its ages were calculated performing a multitemporal analysis of older photos.

RESULTS



- Communities typical of both highly dynamic (active and high bars) and stable (floodplains) units lie on surfaces with different age but at relatively similar elevation.
- The thickness of the sand layer helps explaining differences in areas dominated by different species (e.g. *Salix alba* and *S. eleagnos*).

AF: *Acer-Fraxinus*
 AFA: *Acer-Fraxinus* with *Alnusincana*
 A: *Alnusincana*
 EP: Uncovered areas
 SA: *Salix alba*
 R: Areas with regeneration
 SE: *Salix eleagnos*
 GnV: No vegetation
 EG: In-channel herbaceous
 FC: Flowing channel

- Islands persist on the same area for 15 to 20 years,
- Sand layer thickness is higher on islands and floodplains, which are the older surfaces.
- Differences in species dominating on islands and floodplains suggest their dynamics are different. Islands are in fact generated by a processes of vegetation growth and surface aggradation (building islands) rather than from floodplain dissection.

CONCLUSIONS

- The Piave River shows a complex pattern of vegetation distribution along the cross-sections, with no clear relationship between the elevation and the plant communities. However, later successional plant communities cover older surfaces, and the sand layer thickness helps discriminate communities with different ecological needs.
- Islands are mainly generated from pioneering vegetated areas within the active channel width, and persists for less than 20 years (similarly to what found in the Tagliamento River, Zanoni et al., 2008).
- A recent tendency of active channel widening after a long period of channel narrowing (1970s-1990s) may explain why "mature" patches lie at elevations similar to areas covered with the most pioneer plant communities.

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