RESPONSE OF RIPARIAN VEGETATION TO BACKWATER FLUCTUATION: AN EXAMPLE OF A POLISH CARPATHIAN STREAM



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PROBLEM IMPORTANCE

World: 57 984 (Large >15 m high) Europe: 7 100 (September 2019) (ICOLD)



STATE-OF-THE-ART

-Dam reservoirs may influence riparian vegetation **downstream of dams** (e.g., Bejerano et al., 2018), **along the reservoir shorelines** (e.g., Nilsson and Keddy, 1988; Su et al., 2012), and within the **rivers section affected by water inundation from** reservoirs (during reservoir stages higher than normal (e.g., Xu and Shi, 1997; Aguiar et al., 2019; Volke et al., 2019; Liro, 2019).



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Study area

-Delta-backwater zone of the Rożnów Reservoir (1942) S Poland.

-Small gravel-bed stream influenced by backwater inundation up to 4 m in depth.



Study area



1. Analysis of georectified aerial photos and orthophotos (forest extent and age structure) (10 time horizons from 1944 to 2018).

2. **Floristic inventory** (count of all vascular plant species within 10X10m plots, on floodplain) (35 plots= 26 backwater, 9 control section).

3. Statistical comparison of vegetation indices between control and backwater sections (Bray-Curtis similarity index, Non-metric multidimensional scaling).

Study hypotheses

H1. Backwater conditions favour forest expansion

H2. Backwater conditions decrease vegetation diversity (species number and composition, at the plot scale)

H3. Backwater conditions favour wetland species (*Populus, Salix*) more than the upland species.

H4. Backwater conditions favour annual plants more than biennials and perenials. (better suited for drawdown and subirrigated conditions)

Riparian forest extent



Riparian forest extent













Floristic diversity (total number of species)



- A total of 137 species were recorded in control and backwater sections.
- The total number of species that occurred in each environment was similar.
- Forty species (29% of the total) occurred at both sites.

VEGETATION COMMUNITIES SIMILARITY



- Non-metric multidimensional scaling ordination of vegetation plots illustrates that the two vegetation communities are distinctly different





- The backwater section had a significantly higher percentage of obligate wetland (OBL) and facultative wetland (FACW) species (p=0.011), whereas the control section had significantly higher percentages of facultative upland (FACU) and upland (UPL) species (p=0.0001).

ANNUAL SPECIES



- The backwater section had a significantly higher proportion of annual species than the control section (p< 0.001).

NATIVE vs EXOTIC SPECIES



- The backwater section had a significantly higher proportion of non-native species than the control section (p=0.013).

Discussion and conclusion



Carpathian stream in backwater zone



Dam reservoir backwater influences riparian forest **directly** (water stress, inundation) and **indirectly** (forced land use changes)

Indirect influences favour forest expansion (on previous agricultural land, bars).

Direct influences partly decrease vegetation diversity (lower species number per plot) and alter its composition (more wetland species, more annuals, more exotic species).

Discussion and conclusion

Looking more globally, the increase in forest cover and the creation of wetland habitats in backwater zones compensate their loss in the river sections downstream from dams, but it was not quantified until now.



Thank you for your attention

TRACT

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