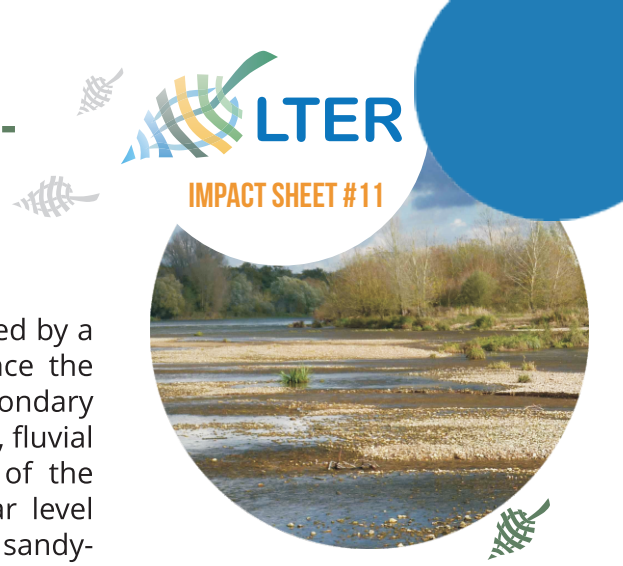


BIODIVERSITY RECOVERY AFTER FLUVIAL MAINTENANCE OPERATIONS IN THE MAREAU-AUX-PRÉS ISLANDS (LOIRE RIVER, FRANCE)

MAREAU-AUX-PRÉS ISLANDS / LTSE ZONE ATELIER LOIRE - LTER FRANCE

The Mareau-aux-Prés islands, along the Loire river, are characterized by a multiple channel pattern, where natural limestone riffles influence the morphology and spatial distribution of vegetated islands, secondary channels and alluvial bars. Within these islands, in September 2012, fluvial management operations (FMO) were launched. The vegetation of the central sandy-gravelly bar (3 ha area) was uprooted and the bar level lowered in order to maintain the flow capacity of the river. A new sandy-gravelly bar appeared in spring 2013. A multidisciplinary research program 'BioMareau' has been conducted, focusing on biodiversity recolonization, and on interactions and feedbacks between biotic and abiotic compartments. The information collected on this LTSE enabled discussing and search for a compromise with the environmental, planning and housing regional agency (DREAL) and local management authorities with regard to the trade-off between flooding protection and biodiversity conservation.



AIMS

- Understanding colonization dynamics of native and invasive species with a focus on colonization by *Populus nigra*.
- Monitoring of gravel nesting birds in this new bare island.
- Understanding the community structure assemblages of ground beetles.
- Understanding the consequences of the modification of the feeding habitat of beaver (*Castor fiber*) on vegetation composition.



OUTCOME - IMPACT

- Improved knowledge and understanding of inter- and intra-annual flooding variations on species richness and composition of Loire river islands.
- Guided fluvial managers in order to perform optimal useful management operations with a minimum loss of biodiversity.

RESEARCH

The consequences of FMO are equivalent to a natural important flood: a new bare mineral substrate has appeared since spring 2013, followed by a succession of geomorphic, pioneer and biogeomorphic phases due to interactions between hydro-morphodynamics and vegetation dominated by *Salicaceae* species. Three regeneration events of *salicaceae* (*Populus nigra* and *Salix* spp.) occurred in 2013, 2015 and 2017, but seedlings did not survive due to flooding. Species richness has gradually increased over 5 years and reached the same level as before FMO. The FMO have not induced species loss nor appearance.

FMO has favored new nesting habitats, especially for the little tern *Sternula albifrons*, as it lays its eggs on bare ground. Reproductive success is thus dependent in spring time on the water level on the bar, and ranges from 0 in 2016 to a maximum of 13 breeding pairs and 11 juveniles in 2017.

Multi-species biotic interactions were also impacted by FMO because modification of the feeding habitat of beaver (*Castor fiber*), which consumes trees in the willow family (*salicaceae*), has led to competition between native black poplar (*Populus nigra*) and the exotic maple *Acer negundo*.

The BioMareau project highlights the complexity of interactions and the key role of the fluctuating water regime in this dynamic part of the Loire river.



From the left:
The Island after fluvial management operations.
Plot measurement within juvenile cohorts of *Salicaceae* vegetation (*Populus nigra* and *Salix alba*).

Sampling a *Populus nigra* leaf for DNA genetic studies.

LTSE ZONE
ATELIER
LOIRE,
FRANCE





3D-Scan of the topography of the new bar created by human intervention (FMO)

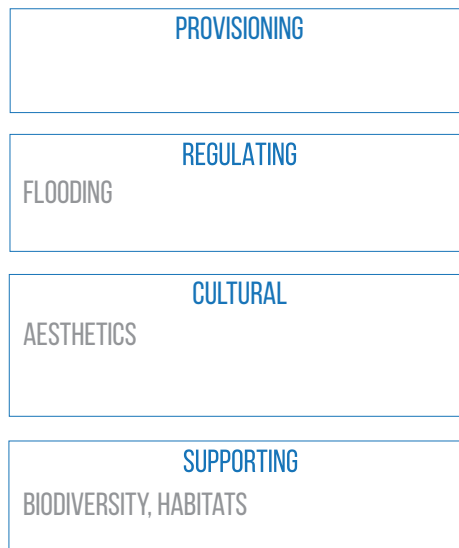


Changes introduced by *Castor fiber* activities

PRIORITY THEMES



PRIORITY ECOSYSTEM SERVICES



AREA OF RELEVANCE, ACCORDING TO SDG



FURTHER INFORMATION

Denux O., Dauffy-Richard E., Rossi JP., Augustin S. 2017. Rediscovery of the endangered species *Harpalus flavescens* (Coleoptera: Carabidae) in the Loire river. *Insect Conservation and Diversity*. DOI: 10.1111/icad.12228

Wintenberger C., Rodrigues S., Greulich S., Bréhéret J.G., Jugé P., Tal M., Dubois A., M., Villar M. 2019. Control of Non-migrating Bar Morphodynamics on Survival of *Populus nigra* Seedlings during Floods. *Wetlands*. DOI.org/10.1007/s13157-018-1121-7

Greulich S., Chevalier R., Villar M. 2019. Soil seed banks in the floodplain of a large river: A test of hypotheses on seed bank composition in relation to flooding and established vegetation. *J. Veg Sci*. DOI: 10.1111/jvs.12762

Video (in French) of the BioMareau research project:
<https://vimeo.com/user2867427/la-tete-dans-la-riviere/video/262417695>

