
Thinking "allelopathy" and "phenology" to enhance ecological restoration success: the case of Upper Rhin floodplain projects

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Abstract

Many ecological restorations projects were developed in major floodplains within the last decades. Most of these projects consisted civil engineering works and usually aimed to increase sites connectivity. However they create a large amount of bare soil surfaces thus dramatically increasing the restored site's invisibility. In order to avoid massive colonization of restored sites by invasive plants, stakeholders should thus develop new ecological restoration methods to enhance biotic resistance of restored communities and therefore prevent invasions.

We here present some study cases where community biotic resistance was enhanced through several methods: (i) **Macrophytes transfer** and (ii) **Soil propagule bank transfert**, both methods as a way to enable a quick colonization and/or limit the invasions, through the settle down of biotic interactions (allelopathy, competition); and (iii) a **temporary disconnection** to connect restored sites with potential invasive plants' sources when these plant' invasiveness is lower due to their phenology.

In the first studies a former gravel pit was restored in North East of Alsace by the creation of shallow water zones on the edge of the gravel pit that is already covered by invasive plant species.

The second study concerned the recreation of a channels' systems within the Rhine floodplain.

Our results suggest that the transfer of a local species that may develop negative allelopathic effects on invasive species together with a timing of restoration in accordance with the species (local and invasive) phenology could enhance ecological restoration success.

Keywords: ecological restoration, allelopathy, species interactions, aquatic vegetation, environmental filters

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