

Understanding the factors of invasion of leafy spurge in the floodplains of the Val de Saône and invasive plant interactions / natural regulators, in a context of integrated management and biological control by conservation

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1. Context

The floodplains of the Val de Saône (VDS) are one of the last large flood meadow areas in Europe. Annual floods, and various cultural practices such as mowing and grazing are the source of a rich floral and faunal diversity protected under the Natura 2000 network.

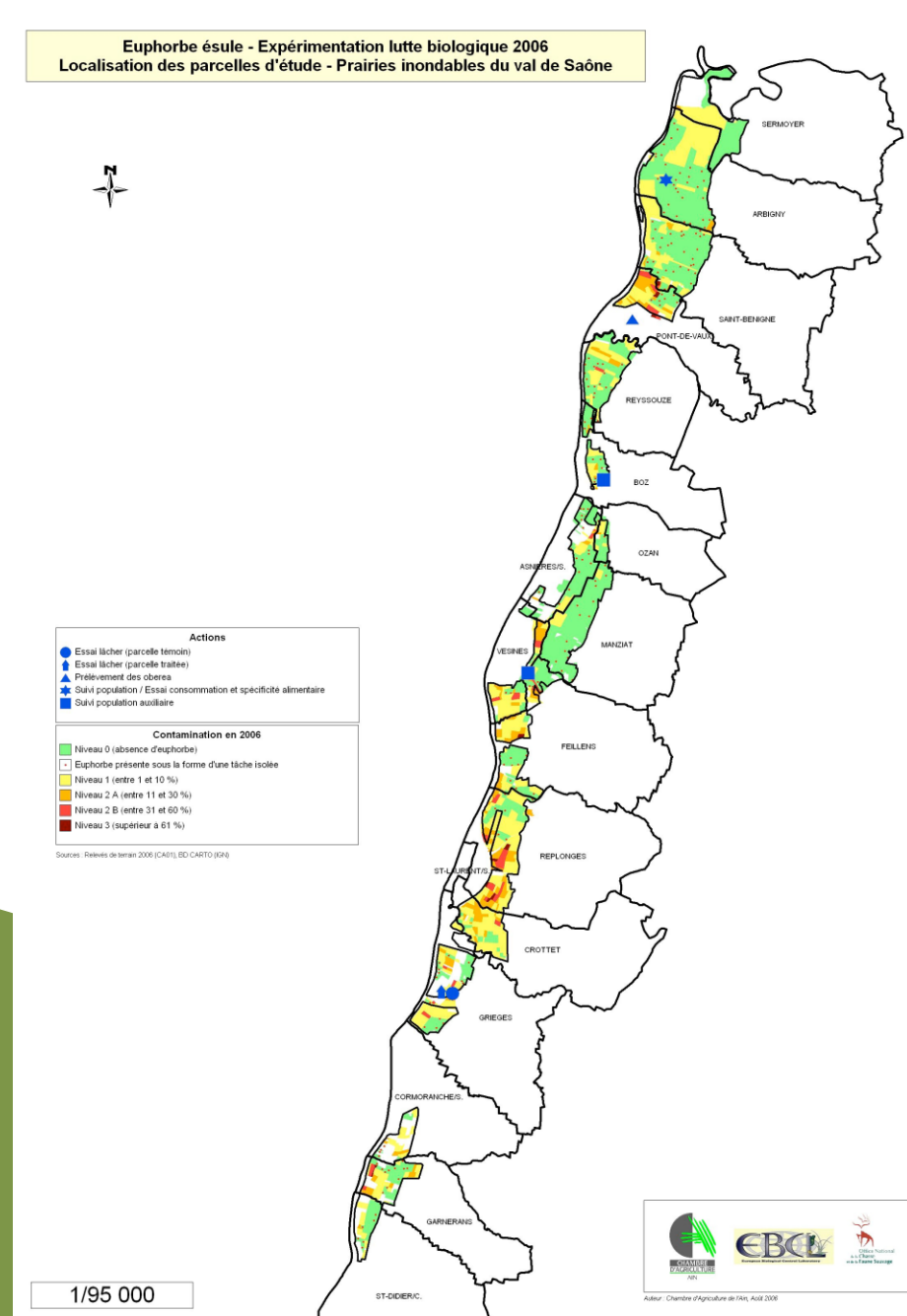
Nevertheless, since the 90s, the native *Euphorbia esula* (Euphorbiaceae), became invasive in these particular grasslands.



Floodplain in the Val de Saône during flood period



Agricultural practices in Val de Saône



Plots studied in 2006 for biological control

2. Understanding the factors of invasion



Flowered leafy spurge

Several chemical control programs have been conducted since 2001 by the Chambre d'Agriculture de l'Ain and the ONCFS, without conclusive results (Curtet et al. 2008), and a biological control program by raising was conducted in collaboration with EBCL between 2004 and 2008 giving random results (Sforza 2009).

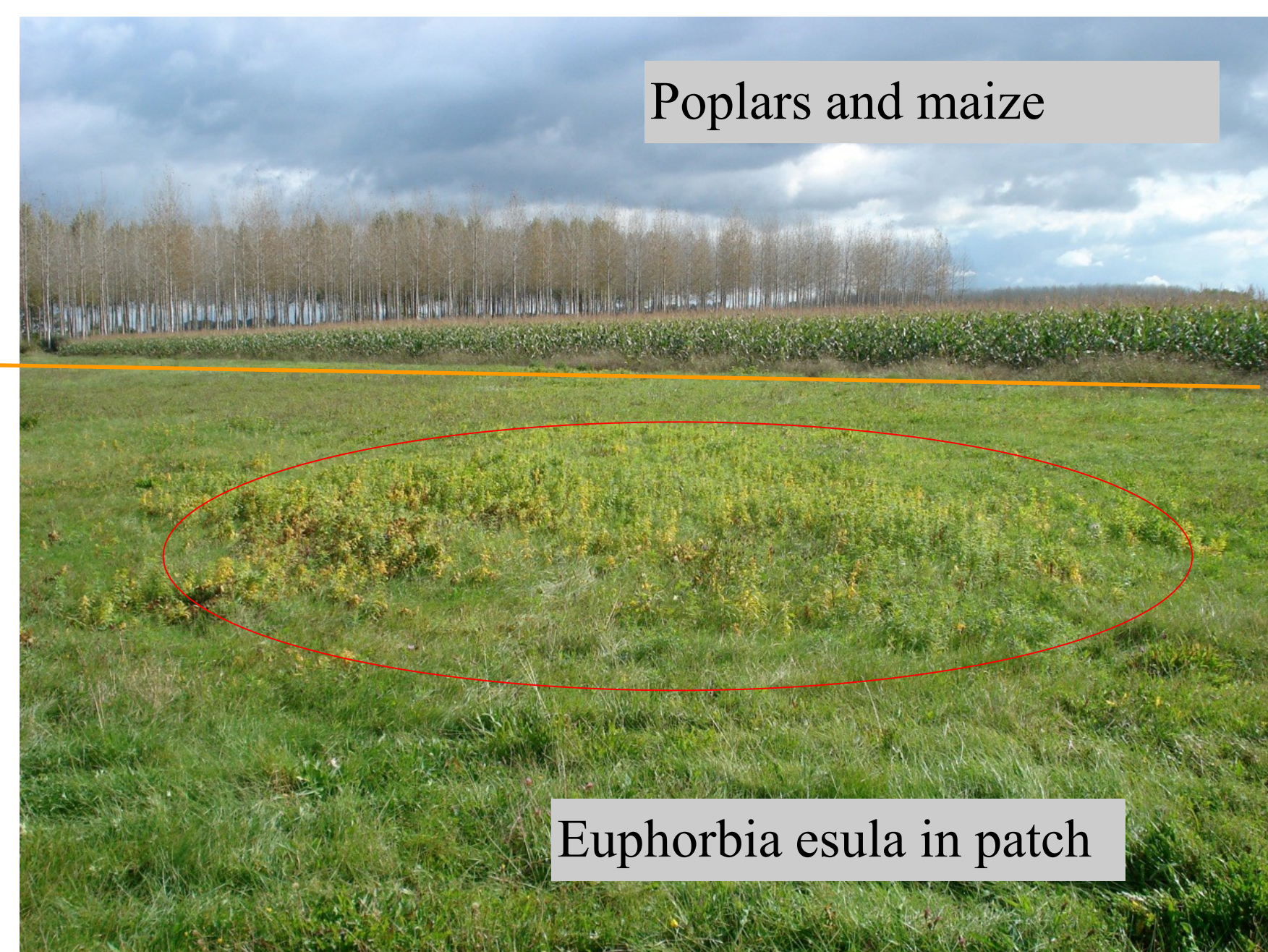
Spatio-temporal mechanisms, abiotics, biotics and anthropics factors :

Invasion structure study using all data available (bibliography, field investigation, teledetection)
- Climatic parameters analyse (temperature, flood intensity)
Study of the ante and post-invasion agricultural practices, in order to know if they are playing a direct role due to a wrong calendar for those practices, or an indirect role on arthropod populations.

Improving knowledges about the invasive species by studying phenology (germination, flowering, fruiting, quantity of seed, plant and roots architecture)



Leafy spurge root system



Poplars and maize

Euphorbia esula in patch

Leafy spurge grows in dense patches and produce a latex, toxic to livestock. From 10 to 20% coverage, it refuses to eat, and all hay containing spurge becomes unfit for consumption, which causes a loss of profitability. The economic loss in turn leads to an ecological risk: the abandonment of meadows or their conversion into intensive agriculture (maize, poplar)

The innovative aspect of this project is the sharing of multidisciplinary data for the study of invasive plant interactions / natural regulatory / agricultural practices / abiotic factors. In addition, no biological control program against invasive plants have been, to date, made in mainland France.

3. Natural regulators & conservation biocontrol

Two natural regulators of leafy spurge have been highlighted in the Val de Saône. These biocontrol-agents, used in synergy or not (Guetsky et al. 2002), could allow the establishment of a program of biological control by conservation



Oberea erythrocephala (Col., Cerambycidae)

- *Oberea erythrocephala* (Col., Cerambycidae) a longhorned beetle. The adult is a defoliator, and larvae are root feeders over winter time.



Spurgia sp. (Dipt., Cecidomyiidae)

- *Spurgia sp.* (Dipt., Cecidomyiidae), a gall maker fly, that prevent seed production (Pecora et al. 1991; Sobhian et al. 2000).



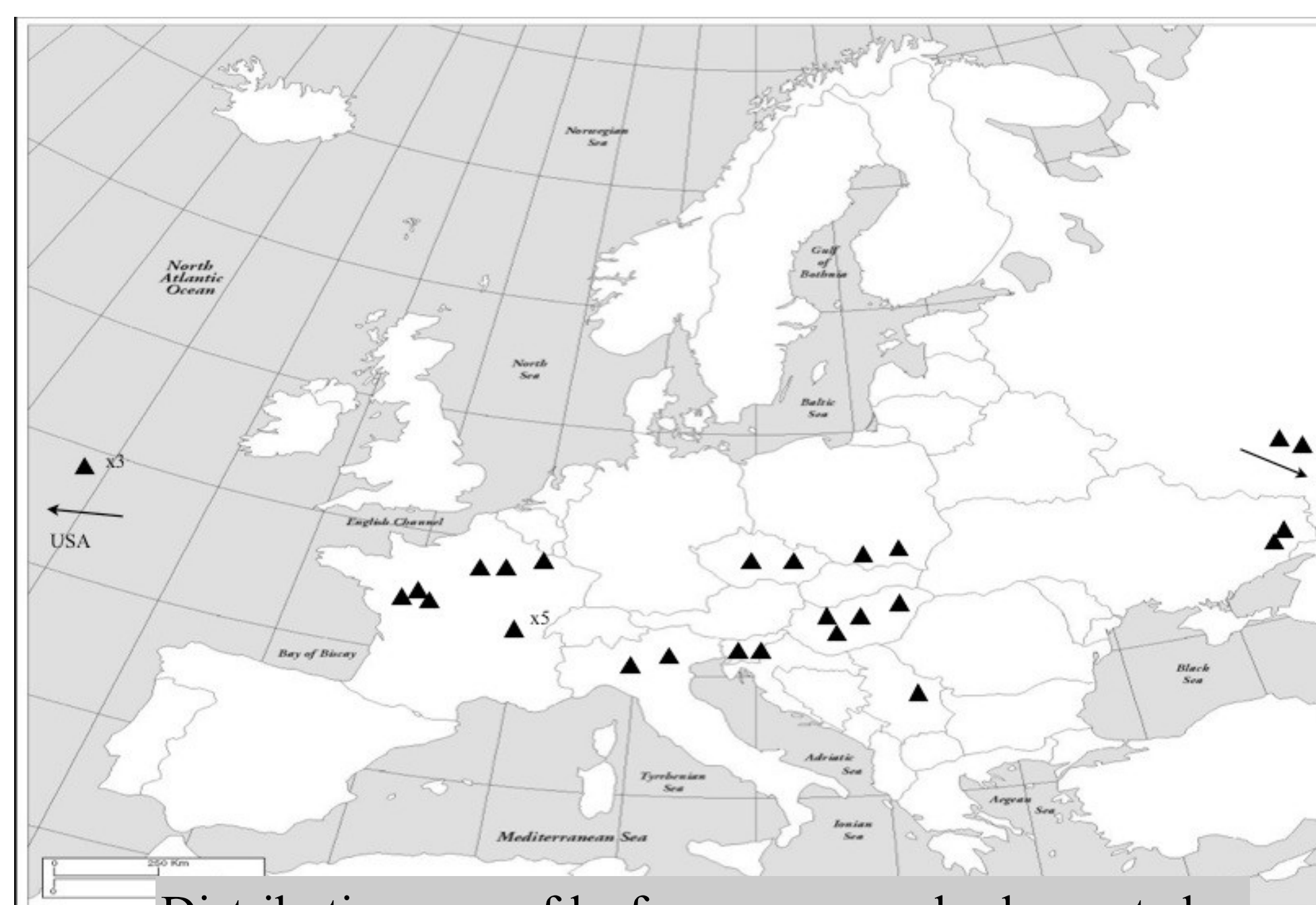
Gall induced by *Spurgia sp.*

The hypothesis is that annual mowing in grasslands prevent the maintenance of high population densities of insects. Thus, the purpose of the program is the establishment of refuge areas allowing natural multiplication of biocontrol-agents (Ruamps-simon 2007). Breeding tests for these two insects will also be lead to achieve biological control by increasing



Larvae of *Oberea erythrocephala*

4. Genetic and phylogeography



Distribution map of leafy spurge samples harvested

A sample of 11 populations in France, and 17 exotics populations (Italy, Slovenia, Hungary, Serbia, Poland, Ukraine, Russia, Czech Republic, USA) has already been done

The purpose of this study is to determine the geographical origin of invasive populations considered to rule out or confirm the hypothesis that invasive populations would be exogenous to the region or at least would have a different genetic signature as a result of a process of introduction or hybridation. For this, genetic characterization, through adapted chloroplastic neutral molecular markers (Weller et al. 2001), will be implemented