



# « Ecohydrology in Haute-Loire »



**Espace Rivière Europe – European River Space**  
Trebon Czech Republic - 9<sup>th</sup> June 2007 – By Cedric GOUINEAU



# Ecohydrology in Haute-Loire ?

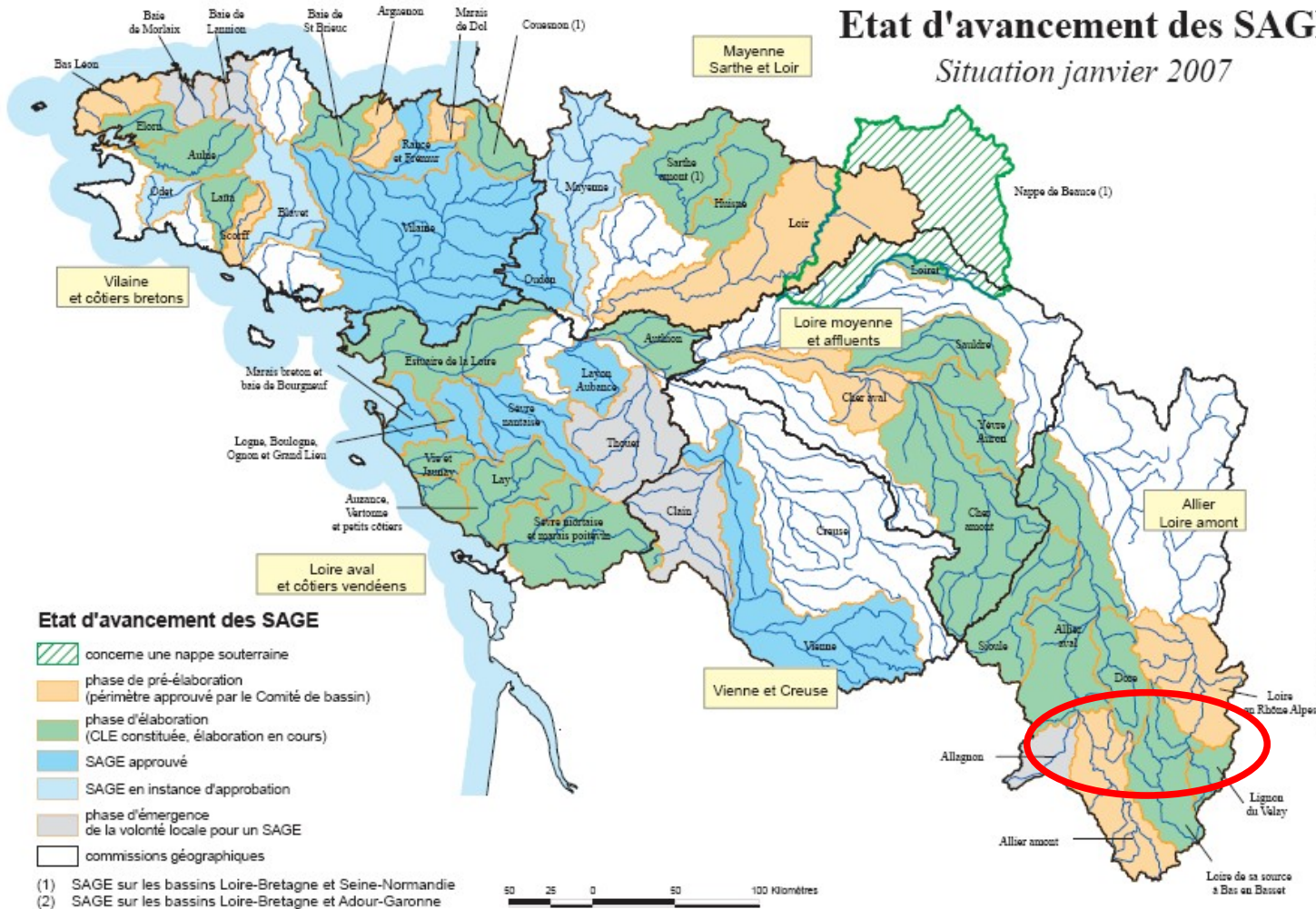
**S.I.C.A.L.A. Haute-Loire !**  
**E.R.E. program !**  
**Experimental projects hold !**  
**New developments !**

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# The Loire basin

## Etat d'avancement des SAGE

Situation janvier 2007



# S.I.C.A.L.A. Haute-Loire

**200 communities 74% of the department**  
**43 employes (30 social)**

**> River basin management**

**> Social employment**

**> International co-operation**

**> Experimental projects**



# River basin management

- > **River banks : restoration and enhancement of riparian vegetation functionalities**
- > **Upstream wetlands : reduce impact of spruce plantations**
- > **Flood risk management through vegetation control, local safety projects and awareness activities**
- > **Support of local water policies**



# International co-operation - E.R.E. program

> **3 countries - 4 partners – 3 years**  
**France / Romania / Italia**

> **Partnership between similar organisations**

> **Create opportunities to develop values of the local territories through environmental, social and ecotouristical projects**

<http://www.ere-concept.com>



# Experimental projects hold !

- > **Hydological monitoring of upstream wetlands - ERE**
- > **Hydromorphological restoration by enhancing hydraulic and biological processes – WFD experimental site**
- > **SAULA – Short crops rotation of willows with sewage irrigation**



# Hydrological monitoring of upstream wetlands - ERE

## 5 steps

**n°1 - Define the potential hydrological impact of spruce plantations on upstream wetland.**

**n°2 – In case impact will be clearly established, the second step is to assess this impact at larger scale (department) using GIS.**





# Hydological monitoring of upstream wetlands - ERE

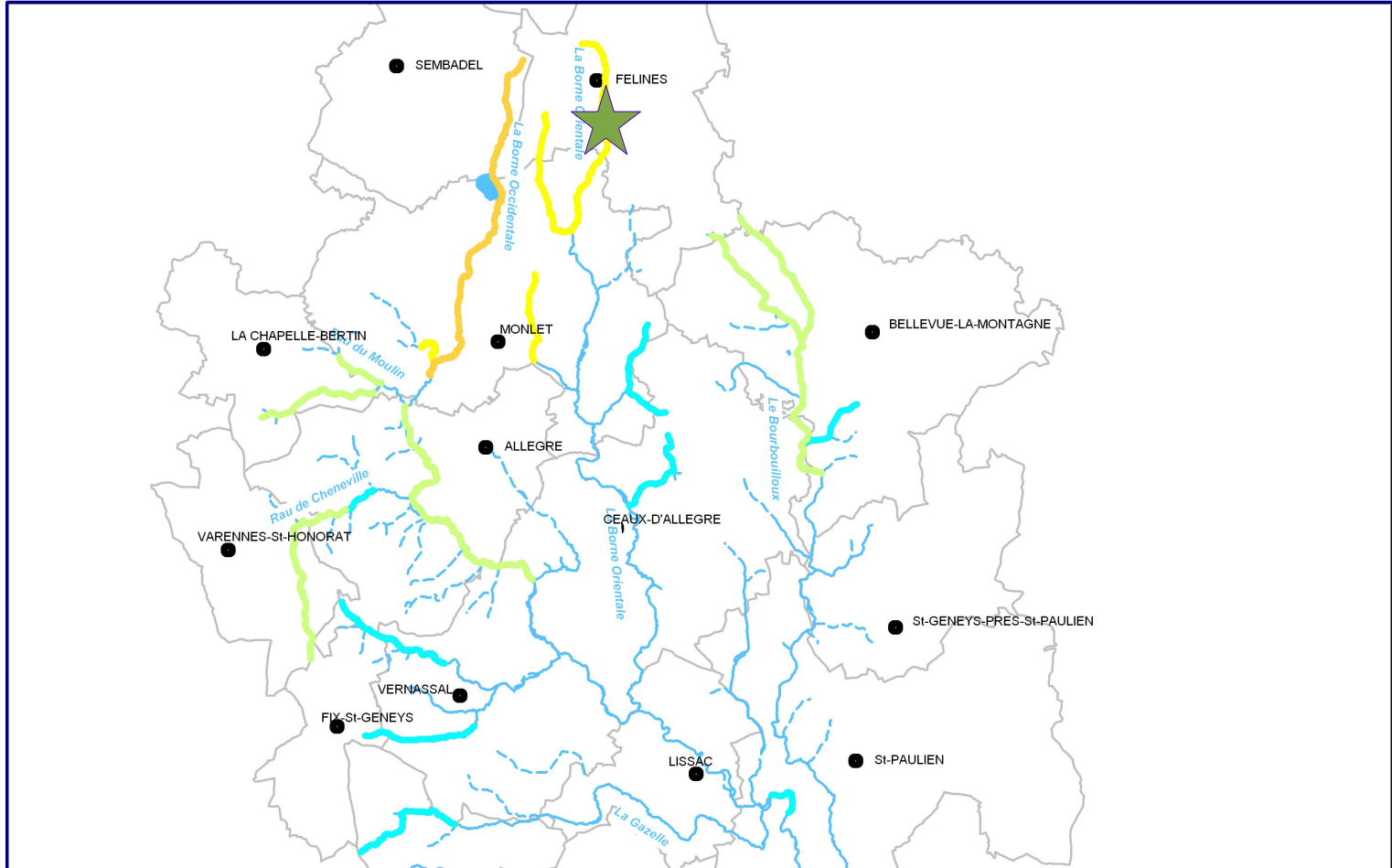
**3 – Define influence of this impact on socio-economical aspects**

**4 - If this impact seem to be important for local authorities, design an ordered action scheme to reduce it.**

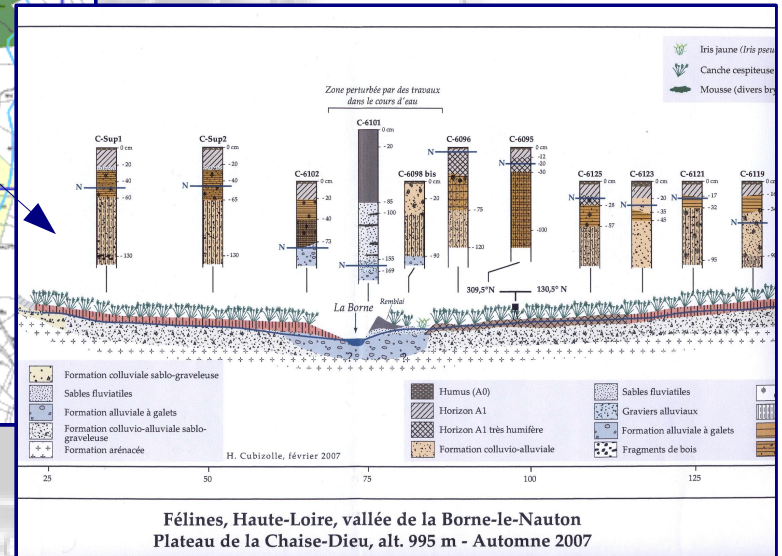
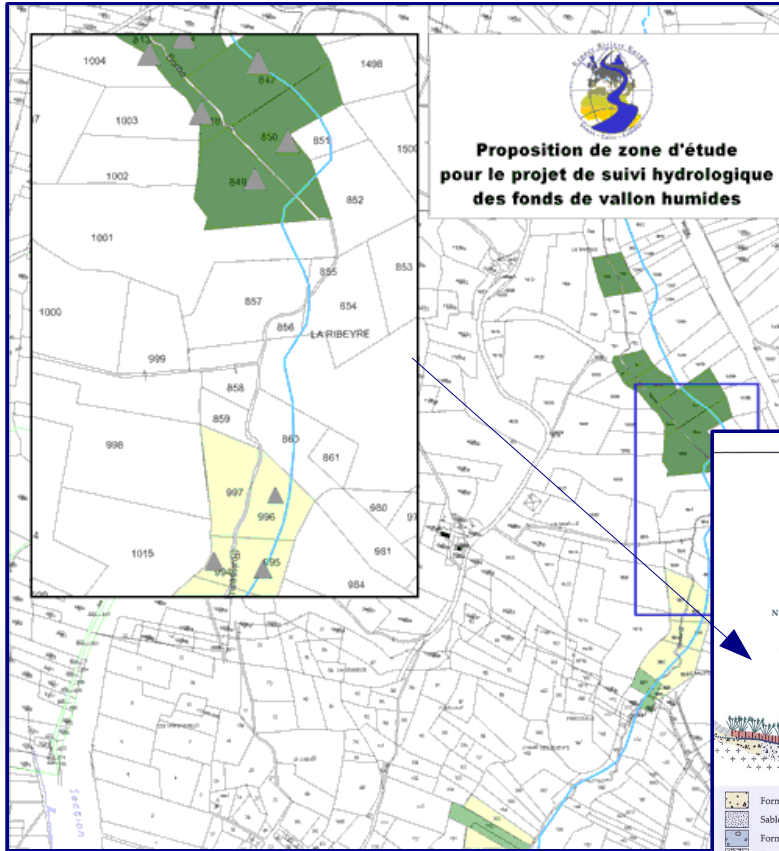
**5 – Find fund to implement !!!**



# Hydological monitoring of upstream wetlands - ERE



# Hydological monitoring of upstream wetlands - ERE

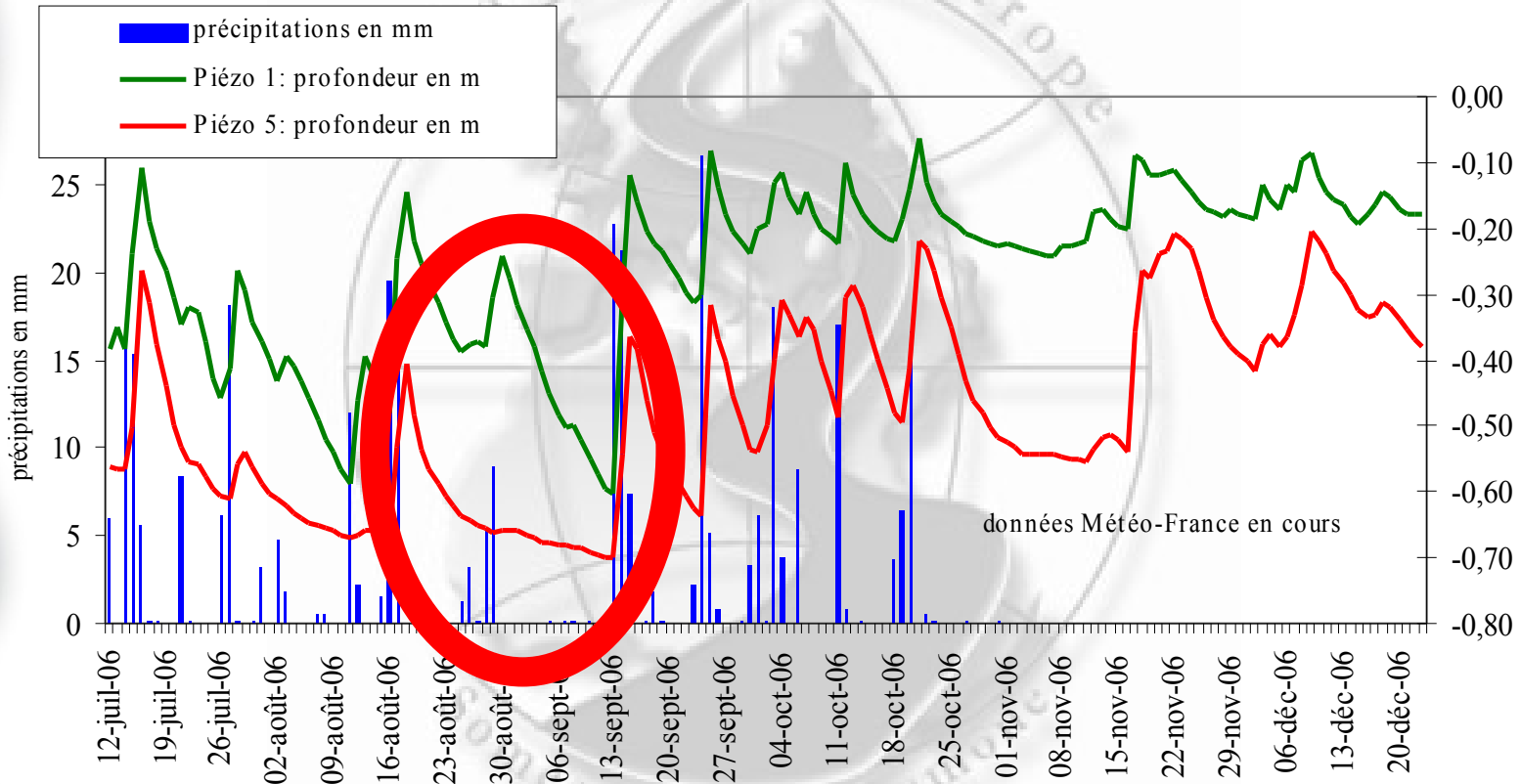


# Hydological monitoring of upstream wetlands - ERE



# Hydological monitoring of upstream wetlands - ERE

Fig. 6: Relation entre les précipitations journalières et les fluctuations journalières de la nappe dans la plantation d'épicéas (piézomètre N° 5) et au cœur du pré à canche (piézomètre N° 1)



# Hydromorphological restoration by enhancing hydraulic and biological processes – WFD experimental site

**The Suisseuse basin got an exceptional flood define as > 300 year return period, 11 years ago .**

**River bed morphology was deeply changed with big damages for people along the river and infrastructures.**

**Unfortunately, local authorities implemented an illegal and wrong management by removing sediments for many years**



# Hydromorphological restoration

## Present state

- High erosion
- Large damages from each low flood
- Death riparian vegetation
- Strong sedimentation in a wider river bed
- Depth of river bed on substratum
- Warm water and shallow flow
- Low capacity of selfpurifying
- Endangered Trout population



# Hydromorphological restoration

## Concept of the action plan

**Provide opportunities to the river to recover a dynamic balance and all functionalities**

- By enhancing biological and morphological processes using phytotechnologies and some rough civil methods
- By using its own hydrological flow
- By developing good practices
- By strong monitoring of this processes





# Hydromorphological restoration

**As this program became a WFD experimental site for hydromorphological restoration on the Loire basin, the water agency asks to include 2 assessment points with standardized measurement of WFD water bodies.**

**In addition a strong monitoring program including new protocols will be implemented to improve each actions :**

- Works' efficacy and stability
- Local works' impact
- Global works' impact



# Hydromorphological restoration

## Planning

- Study conception : 1,5 years
- Study : 3 years
- Monitoring protocols designing : 1,5 year
- Reference state defining > summer 2007
- Operational works designing > autumn 2007
- Works implementation 5 years...maybe 10.



# SAULA – Short crops rotation of willows with sewage irrigation

## Objectives

### Developing a phytotechnology based solution to enhance waste water treatments

- By defining an optimized irrigation management regarding biogeochemical processes
- By defining this system capacities to assimilate nutrients and chemicals through the seasons.
- By defining the rate between area of willow and load of nutrients and chemicals in the water.
- By using **only** local species
- By defining the most appropriated usage of the willows' harvested branches to keep the cycle short.



# SAULA – Short crops rotation of willows with sewage irrigation

**300 m<sup>2</sup> and 4000 willows**

**3 areas with individual irrigation  
programming control**

**Meteorological, hydrological, chemical and  
biological monitoring**



# SAULA – Short crops rotation of willows with sewage irrigation



## Experimental site building



# SAULA – Short crops rotation of willows with sewage irrigation



## Implementation of monitoring devices



## New developments...and so on

- Diatoms as wetlands state indicator
- Soil life enhancement by BRF (sheets of fresh branches incorporated)
- *Salix purpurea* phytoremediation enhancement by mycorrhises
- Gouvernance in water resources management at local level (tools and intercommunity)
- Social and political requirements for WFD implementation (in Romania and ...)
- Implementation of ecohydrological concept
- Students exchange and universities co-operation
- Management plan for water resources (Bulgaria)

**Interreg IVc**

**WFD**

# Actual new partners expected

**Veliko Tarnovo**  
**+ 9 communities on Vessalina river**  
**(Bulgaria)**

**City of Riga and probably 1 community more**  
**(Latvia)**



## Contact

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Nord Est SUD Ouest

**INTERREG III C**

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