Multi-scale integrated approach of hydro-morphology in France

This presentation was originally prepared and presented in Oslo (13th oct. 2015) by:

S. GRIVEL, S. LUCET - French Ministry of Ecology - Water & Biodiversity Departement

B. AUGEARD, K. KREUTZENBERGER, G. MELUN, Y. REYJOL A. VIVIER - National Agency for Water & Aquatic Environments

C. ARGILLIER - IRSTEA

22nd september 2017
Geographical features of the national territory

- 6 river basins & 5 overseas territories
- 22 hydro-ecological regions = 50 types of rivers
- ≈ 250 000 km & ≈ 10 800 water bodies
- Surveillance monitoring network ≈ 1700 stations

Which approach for assessment of hydro-morphology in France?
A multi-scale integrated approach in hydro-morphology objectives

**Spatial scale**

1. **Basin scale**
2. **Stream & river corridor scale**
3. **Stational scale**
4. ... **Dam scale**

**Accuracy of data restitution**

- **Define current status**
- **Assess global risk of alteration**
- **Characterize, quantify and measure alterations**
- **Diagnose the causes of alterations**
- **Decide operation**
- **Plan restoration**

**Instruments and Techniques**

- **SYRAH_CE, ROE**
- **CARHY_CE, AURAH_CE, ICE**
- **Field studies, expertise**
Basin & stream scales: SYRAH_CE

**Irrigation & agricultural practices**

- Land use, roads, levees, riparian area...
- Dams, bridge
- Width, slope...

**Pressure database → 15 thematic maps**

≈ 250 000 km
≈ 70 000 sections

**Instream barriers**
(dams, weirs...)

**Modifications of the riparian vegetation**

**Structures in the corridor**

**Homogeneous reach**

Risk of hydromorphological alteration

- Sediment fluxes risks of soil erosion
Local (statistical) scale: CARHY_CE

Monitoring network: ≈ 1250 stations

Good status = slight deviation from reference conditions

Reference network (for model): ≈ 400 stations

- Hydrology
- Channel geometry & slope
- Riparian vegetation
- Sediment size characteristics
- Bed clogging

Station scale (≈12W)

Catchment scale
CARHY_CE aims and prospectives

**Objective 1:**
- Define a spatial, dynamic, regional reference
- Evaluate the deviation from this reference
- ...Then define a level of alteration

**Objective 2:**
- Links between hydromorphological stations & biological surveillance stations (compare hydromorphological conditions, river habitats & species diversity)
Example 1: Assessing pressures and alterations on river continuity

Large scale assessment (SYRAH CE + ROE)

Local scale assessment
Prospects 1: Linking continuity alterations and impacts on biology

Using indicators and new methods

Watershed scale assessment

Reach scale assessment

To an indicator of river discontinuity
(biology & sediment dynamic: ICS in progress)
Example 2: Assessing hydrological alterations

Large scale assessment (SYRAH_CE)

Example of metric used:
*Total water storage/annual flow*

Local scale assessment

Example of metric used:
*Indicator of hydropower impact*

Synthetic indicator of annual hydrological disturbance

(Courret 2015)
Prospects 2: Linking hydrological alterations and impacts on biology

Using fish habitat to manage

Watershed scale assessment
Defining the maximum abstraction allowable using fish habitat modelling at several sub-catchment outlets

Reach scale assessment
Defining environmental flows downstream a dam using fish habitat modelling

Fish habitat modelling
Morphology/Hydraulics
- Water Depth
- Flow Velocity
- Substrate

Biological preferences

Habitat Suitability

Subcatchment outlets (© EVP Buech)

Adapted from Casimir model website
Solution of multi-scale approach: biocenoses/ ecological status and hydro-morphological restoration

1. Scientific monitoring programs of national restoration sites

2. Network of restoration sites using homogeneous field protocols (WFD compatible) and sampling frequencies

- Biology
- Hydromorphology
- Physico-chemistry

→ Mid-term perspective
Lakes and reservoirs - a similar approach

**Multi-scale development**

- **Stressors in the catchment area**
  - Bavela Method (GIS)
  - Connectivity (ROE)

- **Stressors and alterations in the corridor**
  - Corila (GIS - BD Topo®)

- **Riparian and shore zone characteristics and alterations**
  - AlBer (field survey)
  - Charli (Field survey)

- **Depth, shape and bottom**
  - Bathymetry
  - Characterisation of the sediments (Roxann)

- **Field survey**
- **Acoustic methods**
Conclusion

• Substantial progress during the first cycle: inclusion of hydromorphology and implementation management in river basins → To continue for the 3rd cycle WFD

• The multi-scaler integrated approach as an operational key for the hydromorphological restoration (rivers and lakes)

• But many questions remain! Scientific results to enhance and operationalise

• Need to share experiences / methods / results between Member-States
• What kind of networks do you have on your territory to monitor the hydromorphology? How many sites it represents?
• For how many river’s types is your method applied?
• Does it exist any system able to valorise the data collected on field?
• Is there any question/probable evolution in the way you monitor the hydromorphology on your territory?
Thank you for your attention!