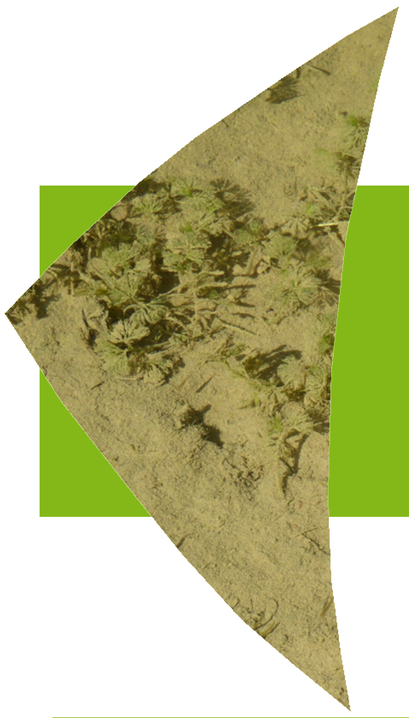


# Collaborative field trial for the harmonization of sediment sampling protocols in Switzerland

M. Wildi*, C. Casado-Martinez, B.J.D. Ferrari, I. Werner
Centre Ecotox Eawag-EPFL
*Contact: michel.wildi@centreecotox.ch

## Context and objectives

- In Switzerland, the 26 cantons are in charge of implementing the Swiss Federal Water Protection Ordinance [1].
- In collaboration with the Federal Office for the Environment (FOEN) the Ecotox Centre (EC) is developing a module for **sediment chemical quality assessment.**
- The EC conducted a survey and qualitative interviews to the 26 cantons in 2010 [2] and 2015 :

➞ Until now 14/26 of the cantons have been performing sediment assessment by chemical analyses and comparison to soil or ICPR (Rhin) reference values.

However, **no harmonized protocols exist** considering key steps which are:

- Fraction of sediment analyzed (2 mm vs 63 µm).
- Sieving procedure (*in situ vs ex situ*, dry *vs* wet).
- Replicates *vs* composite samples.
- Extraction method for metals analysis (HF *vs* $HNO_3$ *vs* Aqua Regia).
- Performed ancillary measurements

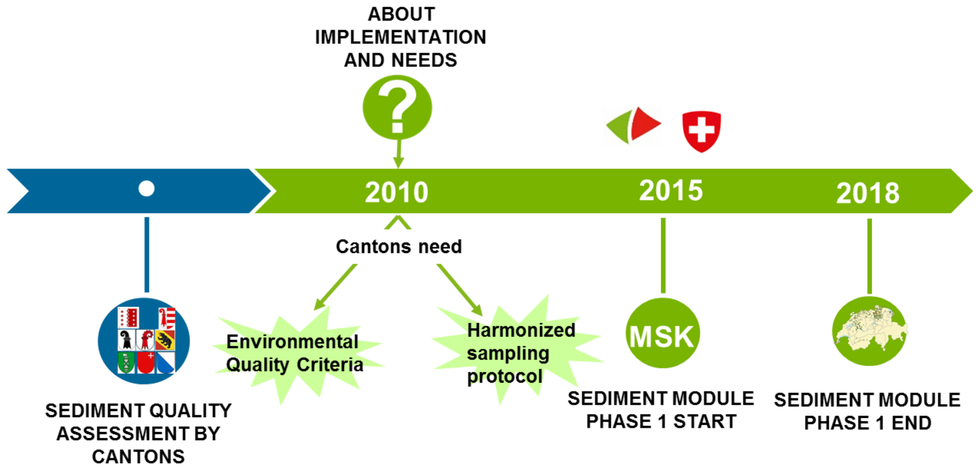
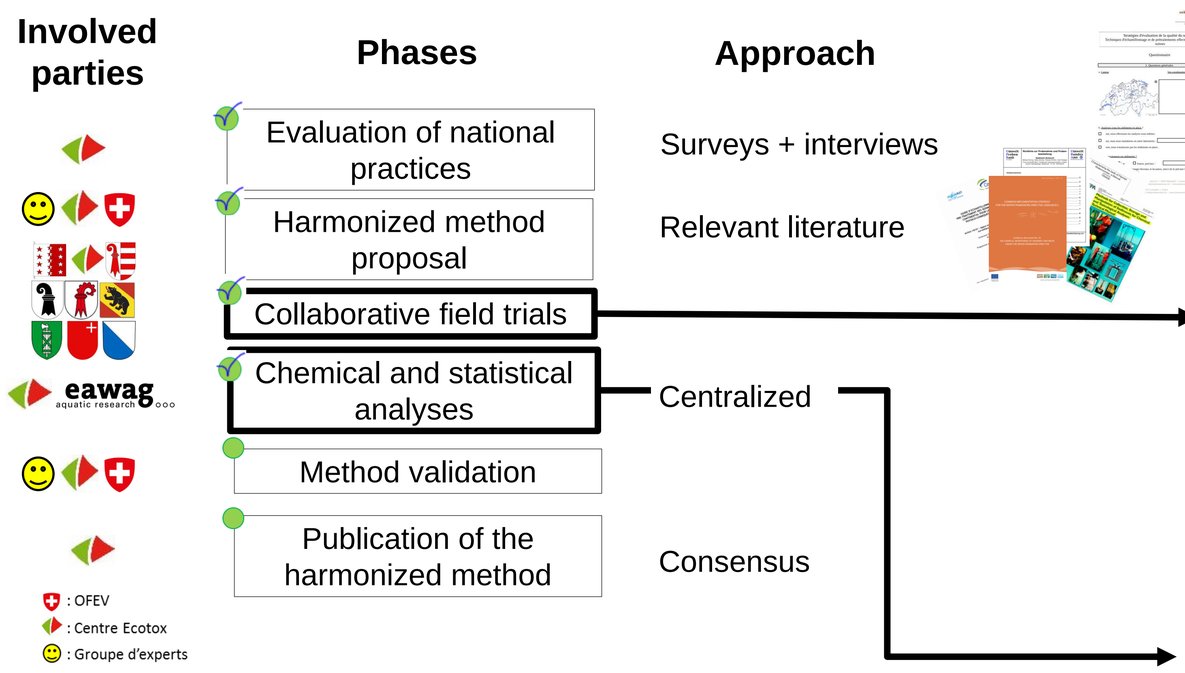



*Fig. 1 Timeline. In 2010, the EC performed a survey to evaluate current practices and needs to the cantonal environmental agencies. In 2015, the EC with the support of the Swiss Confederation, formed an expert group and started the development of a module sediment for the "Modular Stepwise Procedure" (MSK).*

**Study objective:** Provide recommendations for a harmonized protocol for sediment sampling and pretreatment in Switzerland, taking into consideration current practices and "state of the art", for chemical quality assessment of sediments by means of sediment quality criteria.

## Methodology



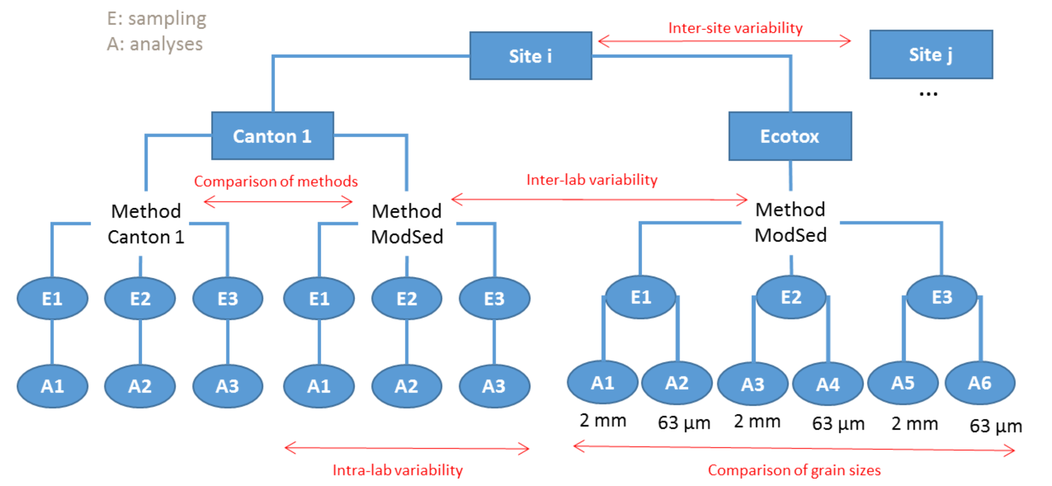




*Fig. 2 Collaborative field trial Phase 1: evaluation of the degree of agreement between cantonal methods (Method canton #) vs harmonized proposal (ModSed protocol). The exercise involved eight cantons and the EC and fourteen different field sites.*

Comparison of four extraction protocols currently applied by cantonal agencies on seven samples with different characteristics and pre-treatment (Fig. 3).

## Preliminary results

### Sites


*Fig. 3 Sites included in the field collaborative trial: fourteen sites with different regime, river bed, substrate and pollution sources (metal industry, WWTP, agriculture, etc.).*
*1) Calcareous river; 2) Alpine river; 3) Agricultural channel; 4) Lake delta.*

### Sampling and sieving methods


| A | B | C | D | E |
|---|---|---|---|---|
| Direct sampling in flacon<br>Single replicates<br>Drying, then 63 µm sieving. | Coarse-wet sieving in field<br>Single replicates<br>63 µm automated wet sieving in the lab, then drying | *In-situ* 63 µm wet sieving on filter with adding 5 L site water<br>Composite sample<br>Sediment settle down 24 h, drying | In-situ 63 µm wet sieving with addition of 2 L site water<br>Single replicates<br>Sediment settle down 24 h, drying | In-situ 2 mm wet sieving<br>Composite sample<br>Freeze drying |

*Fig. 4 Illustration of cantons with different sampling methods that include different sampling devices, sieving procedure and pretreatment.*

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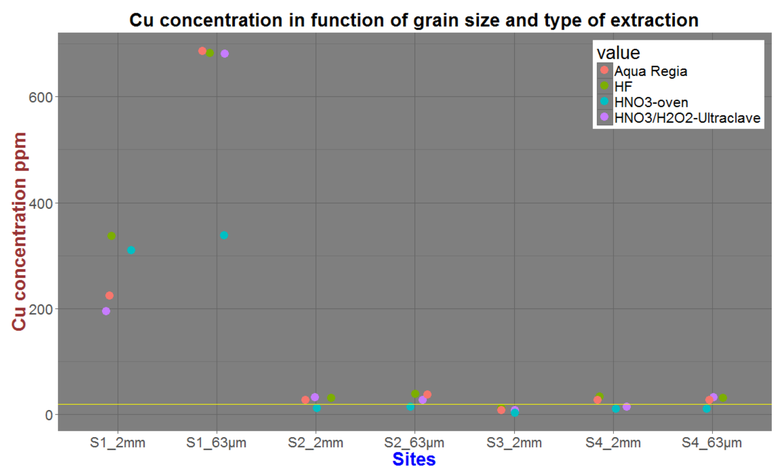
### Extraction methods

*Fig. 5 Comparison of Cu concentrations at sites 1 to 4 (Fig. 3) after different sample pre-treatment (sieving 2 mm vs 63 µm and extraction). Yellow line: Flemish SQG for copper (20 mg/kg dw). Depending on the extraction used, sediment Cu concentration is above or below the threshold value.*




### Conclusions and perspectives

- The selection of the sediment fraction to analyze (63 µm *vs* 2 mm) and the extraction method is critical for any future comparison with effect-based SQGs for sediment quality assessment.
- All samples from the field trial are currently being analyzed.
- Depending on the results, recommendations for the sediment fraction and pre-treatment will be provided.
- A performance test will be carried out using the proposed harmonized protocol (eight operators at the same site).
- The recommendation of one single method that suits all objectives (e.g. site specific assessment of sediment quality, temporal trend analysis or identification of pollution sources) and types of water bodies appears, challenging.

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References :
[1] Office Fédéral de l'Environnement (OFEV). 1998. Ordonnance du 28er octobre 1998 sur la protection des eaux (OEaux). N° RS 814.20. Bern, Suisse. [2] Flück et al. Surveillance de la qualité des sédiments. État actuel des méthodes disponibles et mise en place de recommandations. Aqua & Gas 4. Avril 2012.

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