IUGS – FOREGS - GEMAS
Sediment sampling protocols

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Samples should be collected at the outflow of basins, preferably not exceeding 100 km² in area. Basin size is the prime consideration in site selection for drainage samples and all types of sample should be collected in the same vicinity. The basins to be sampled will be from within the 20 (or 40) km sub-cells selected as indicated in Section 4.4 above. It is acceptable to sample basins which extend into adjoining subcells.

Samples should be collected from the inorganic fine-grained silt and clay fraction of the stream bed load. *In situ* precipitates should be avoided. Active sediment is the preferred material. A minimum of 10 grab samples should be collected in each stream from different parts of the stream bed over a minimum distance of 500 m. Collectively these constitute one site.
FOREGS – European Geochemical Mapping

Environmental Geochemistry
for Global Survival

IUGS/IAGC project
“Global Geochemical Baselines”

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- Multi-media
  stream water, stream and floodplain sediment, soil (A and C horizons)
- Multi-element
- Composite (elements, parameters: pH, OM, etc.)
- Catchment-based
- Continental
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APPENDIX 1: Field observation sheets: Stream water/stream sediment, humus, soil, floodplain sediment, overbank sediment
Diagram showing possible sampling sites of GTN sampling media (modified after Strahler 1969).

Fig. 5. Block diagram showing residual overburden (soil), colluvium, old and present day floodplain sediments (modified after Strahler 1969).
3. Place the bottles in a cool unit, e.g. refrigerator.
4. Send water samples to the laboratory soon after sampling.

3.2 Stream sediment

Active stream sediment represents the fine- to medium-grained bed load material (silty-clayey-sandy), which is transported by running water. The active stream sediment is collected from the small, second order, drainage basin (< 100 km²) at a suitable site above its confluence point with the third order, channel of the large drainage basin.

Studies into the distribution of trace elements in relation to the size fraction of stream sediments generally show that several elements including Mo, Cu, Zn, Mn and Fe are concentrated in the finest fractions of the sediment. The majority of stream sediment surveys have, therefore, been based on the collection of <0.200 mm material. The IGCP 259 and FOREGS standard sieve mesh is <0.150 mm and is fine enough to only include the very finest silt, clay and colloidal fractions, but is coarse enough to yield sufficient fine material in the major

3.2.1 Stream sediment samples to be collected

Each stream sediment sample comprises material taken from 5-10 points over a stream stretch of 250-500 m. Prior to stream water and stream sediment collection, it is important to identify the 250-500 m stream stretch where obvious signs of contamination can be avoided and suitable sediment can be collected from 5-10 different locations. Sites should be located at least 100 m upstream of roads and settlements. Stream sediment sampling should start from the wash

3.2.2 Equipment

3.2.2.1 Equipment to be provided by regional laboratories:
- Kraft paper bags
- Polyethylene bags

3.2.2.2 Equipment to be purchased by each participant:
- Heavy duty elbow length rubber gloves
- Metal free polyethylene funnel
- Sieve set with 2 preferably wooden or plastic frames containing nylon 2.0 mm mesh and nylon 0.150 mm mesh screens
- Metal free gold pan or plastic bucket
- Metal free plastic crates
- Metal free plastic buckets or containers with lids
- Trenching tool - metal free, polyethylene (PE) or polypropylene (PP)
- Permanent drawing ink marker (preferably black or blue)
- Permanent ink pen
- Maps (topographical maps, preferred scale 1:50 000)
- Chisel-end geological hammer for dry areas (e.g. Mediterranean countries)
- Bristle brush (dry sediment samples)

Field observation sheets are included in this
3.2.3 Sampling procedure

Mark the sample identifier on the Kraft paper bag using permanent ink marker. Mark the exact site location of the first and last subsamples on the field map by means of a small lines perpendicular to the stream flow. Complete the details of the field observation sheet.

Wet sieving is recommended whenever it is possible. Instructions for sampling with wet sieving method are presented in section 3.2.3.1. If it is not possible to wet sieve the stream sediment sample in the field, the collected stream sediment material should be dry sieved. Instructions for sampling and dry sieving are given in section 3.2.3.2.

3.2.3.1 Sampling and wet sieving

Once the site for sampling has been selected, mark the exact location of the first and last sampling points on the field map by means of a small line perpendicular to the stream flow using the ink pen. Mark the sample identifier number on map next to the sampling location. Complete the details on the field observation sheet. Write the sample identifier on the collection bucket and lid using the permanent drawing ink marker.

Rubber gloves are recommended for protection throughout sampling.

-Enough coarse grained material should be collected to yield a minimum of 0.5 kg  <0.150 mm material (dry weight).

The amount of coarse material required will vary substantially depending on the underlying geology and terrain. Geochemists should use their knowledge and judgement to assess how much coarse material will be required.

- Mix the buckets of the coarse sediment thoroughly with the plastic stirring rod and carry them to the sieving location.
- Load sediment into the top sieve with the spade. If more than one bucket of coarse sediment has been collected, equal amounts of sediment should be loaded into the sieve from each bucket in turn.
- Rub the material through the top sieve wearing rubber gloves for protection.
- Take care to remove large stones from the sediment by hand.
- Once the bottom sieve contains a reasonable quantity of <2 mm sediment, remove the top sieve and discard the >2 mm material.
- The <2 mm sediment in the bottom sieve is washed and rubbed through the sieve with the aid of water and shaken down.
- It is very important at this stage that coarse material which would bias the sample does not enter the collection bucket. This may be avoided by carefully washing the outside of the bottom sieve prior to shaking.
- In order to enhance the trace element signature, it is
recorded on the field sheet and on a sample check-list sheet.

- Once the sample has been homogenized, carefully transfer the sample into the Kraft bags using a clean plastic funnel.
- The Kraft bags should be hung out to air dry at the field base for as long as possible.
- When moving the samples, place each Kraft bag in a 15 x 40 cm polythene bag and secure the top of the bag with a knot to prevent loss or cross contamination of samples during transport.
- The samples should be secured upright in a plastic crate or box and transported carefully to the next location or to the Survey base for further drying.
- At the Survey base or laboratory, the samples should be completely dried at < 40°C. Freeze drying is recommended as this helps to disaggregate the samples. Dried samples should be sent to LAB I.

All sampling equipment must be thoroughly cleaned between each site to avoid cross contamination.

3.2.3.2 Sampling and dry sieving

The procedure for the selection of sample sites, recording their location on the field map, completion of field observation sheets, wearing of rubber boots, and cleaning of sampling equipment must be adhered to.
3.4 Floodplain sediments

A floodplain sediment, representing the alluvium of the whole drainage basin will be collected from the alluvial plain at the lowermost point (near to the mouth) of the large catchment basin (1000 - 6000 km²).

Both floodplain and overbank sediments are fine-grained (silty-clay, clayey-silt) alluvial soils of large and small floodplains respectively, according to the size distinction made by Darnley et al. (1995). Floodplain and overbank sediments are deposited during flood events in low energy environments (Ottesen et al., 1989); they should, therefore, be devoid of pebbles, which indicate medium energy environments. The surficial floodplain and overbank sediments are normally affected by recent anthropogenic activities, and may be contaminated. Deeper samples, which are optional sample media, normally show the natural background variation.

### 3.4.1 Floodplain sediment samples to be taken

From the first sampling site of a duplicate cell (one in each country) collect:

- 2 kg of top floodplain sediment + 2 kg of top floodplain sediment (duplicate sample)

From all other sampling sites collect:

- 2 kg of top floodplain sediment

Enough material must be taken to yield minimum 0.5 kg of <2 mm grain size sediment. Larger sample quantities can be taken and stored separately in each country.
3.5 Overbank sediments

An overbank sediment, representing the alluvium of the small drainage basin will be collected from its alluvial plain near to the confluence point of the small, second order, stream (< 100 km²) with the main, third order, river.

3.5.1 Overbank sediments to be taken

All overbank sediment samples are optional. FOREGS laboratories will not provide analyses of
Sample preparation

Start with batch of stream sediment samples size fraction <0.15 mm

Drying at 40°C

Mixing by shaking

Weighing ——— Waste

500 g subsample

Quartering by rotary divider — Arbitrated sample stored in Lab I

200 g subsample

Pulverising by agate disc mill

50 g analytical size fraction <0.063 mm

50 g analytical size fraction <0.063 mm

100 g duplicate sample size fraction <0.063 mm

QC test sieving control by 0.063 mm sieve

Packing sample PE bottle

Sending to Lab II for XRF analysis

Packing sample PE bottle

Sending to Lab V for ICP-MS analysis

Packing sample PE bottle stored in Lab I

Fig. 13. Screening standard operating procedure for stream sediment samples.
FOREGS GEOCHEMICAL BASELINE PROGRAMME

TOP ID ___________________ Date _______________ Sampler ___________________

BOTTOM ID ________________ Country ___________________
(Bottom floodplain sample is optional) Organisation ___________________

GTN cell coordinator if different from above ___________________

SAMPLE SITE LOCATION

REGION __________________________ MAP SHEET _____________

COORDINATES (Decimal degrees mandatory)

National grid Easting _______________ Northing _______________
Decimal degrees Longitude _______________ Latitude _______________ Datum _______________
Altitude (m) _______________

DESCRIPTION OF CATCHMENT BASIN

Approximate size of catchment basin _______________ km²

Landscape / topography _____________________________________________

Land use

☐ Agriculture
☐ Pasture, grassland, fallow field
☐ Forest:
☐ Wetland
☐ Non-cultivated, moorland etc.
☐ Other, specify _____________________________________________

Predominant bedrock lithology within catchment basin ________________________

SITE DESCRIPTION

River width _______________ m, depth _______________ m

Grain size range at sample site ☐ sand - silt ☐ silt - clay
Abundance of clasts > 2 mm in %: ____________________________

Depth of observed groundwater table (cm) _______________

Sampling interval from surface ☐ 0 - 25 cm ☐ other, specify: _______________ cm

Possible sources of contamination, specify _____________________________________

PHOTOS

Film and photo ID

Landscape ____________________________

Site ____________________________

GAMMA-RADIATION

Total ___________ Th ___________ U ___________ K ___________

Instrument ____________________________

REMARKS
GEMAS – European Soil Chemistry Atlas

Quality Control

GEMAS
Geochemical Mapping of Agricultural and Grazing Land Soil

EuroGeoSurveys Geochemistry Expert Group
Contact: Clemens.Reimann@ngu.no