

## 7.1 PROTOCOL FOR SEDIMENT MONITORING FOR NUTRIENTS, METALS AND PHYSICAL CHARACTERISTICS

### Overview

Sediments can be collected using either a grab or core sampler. Core samplers are tube-like devices that penetrate the sediment by gravity (free-fall), vibration, hydraulic pressure (water or oil) or by hand (scuba divers). Sediment cores are taken to determine recent and/or historical sediment physicochemical conditions in depositional aquatic environments. The best time to collect bottom sediments from flowing water bodies is during ice-free low flow periods when depositional zones can be easily identified and sampled.

### Sources

Alberta Environment (2006 a), Environment Canada (1999), Newfoundland and Labrador Environment and Conservation (1999)

### At a glance

*typical  
gravity core  
sampler*

#### Core sampling

This procedure is specific to gravity corers that are released at the water surface, allowed to free fall and penetrate the sediment under the samplers own weight. A typical gravity core sampler is a length of cylindrical pipe with a weighted head. A liner that is usually made of plastic is inserted to hold the sample. The type of liner appropriate for sampling depends on the sediment variables to be analyzed. At the bottom end of the sampler is a metal core cutter that facilitates sediment penetration (nose piece), and a core catcher to retain the sediment in the liner. At the top end of the sampler is a ball-valve or piston that retains sediment in the liner when the sampler is retrieved from the sediment.

- 1** Place a clean liner in the corer or each of the four barrels of the corer, depending on the type of corer being used. Push the liner in until the o-ring fits snugly. The liner should protrude 2 to 5 cm at the bottom.
- 2** Set the stoppers in the open position.
- 3** Lower the corer over the side of the boat (ensure that the rope is securely attached to the corer and the boat). Lower the corer slowly to minimize the creation of shock waves at the front of the sampler that may disturb and re-suspend fine sediments. Let the corer slowly sink straight into the sediment.
- 4** Release the messenger.
- 5** Raise the corer after the messenger releases the stoppers. Just before the bottom of the corer breaks the water surface, have a second person reach under and quickly cap the cores with the insert liners. Raise the unit into the boat, keeping it in the upright position.
- 6** Remove each liner from the bottom of the corer. Be careful

not to spill any of the enclosed water and then cap the top of each core tube and place in holder.

**7** Taking one core at a time, remove the bottom cap and quickly replace it with the core extruder. Keep constant pressure on the top cap when doing this to help form a vacuum.

**8** Core samples are acceptable if the core was inserted vertically into the sediment, adequate depth was sampled, and there was no sediment loss.

*record  
information*

**9** Photographs, field notes, and measurements should be recorded during sediment core collection. The core should be photographed twice with a digital camera; once in ambient light and once using a fill-in flash. The core sample should occupy a minimum of 70% of the image and a label and a scale (ruler) should be included in the view. Additional photographs should be taken if any anomalies or artifacts are encountered.

**10** Record the total core depth, vertical profile/structure (i.e., depth and description of distinct layers), type of material (soil type, colour, moisture condition, density, and grain size), biological structure (e.g. shells, large tubes, biota, macrophytes), debris (e.g., wood chips, plant or other fibres), obvious signs of anoxia (e.g., black layers), degree of sample disturbance, obvious odour or oily sheen, and any other unusual properties.

**11** Record target and actual sampling location (GPS), date and time of sample collection, overlying water depth (m), ambient weather conditions, core penetration depth, sampling personnel, and any deviations from the field sampling procedure.

*cutting core  
into sections*

**12** To cut the core into sections, remove the top cap from the tube and siphon off excess water. Carefully push the sediment core to the top of the core tube, expelling any remaining excess water. Set the core slicer on the top of the sediment tube. Push the sediment into the core slicer and cut off the required amount of sample, usually the upper 4-6 cm (can be 2 to 10 cm of the upper layer). Place the sample in a labeled sample container. Place each sample container in two Ziploc-type plastic bags (double-bag) in case of leakage.

**13** Rinse the tubes and corer with lake water before collecting new samples or decontaminate the equipment between sites.

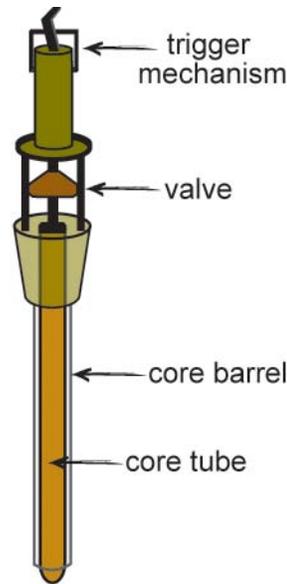


Figure 10. Kajak-Brinkhurst core sampler  
(British Columbia MWLAP (2003))

### Sediment grab sampling

This procedure is specifically used to collect surficial sediment samples and is conducted when the quality of recently deposited sediments is of interest and relatively large volumes of sediment is required. Grab samples can be easily taken in depositional shallow sediments or in relatively coarse sediments, where core samples cannot be obtained. Each device consists of a set of mechanical jaws, which shut when lowered into the sediment. The three commonly used samplers are Ekman (used for soft fine-grained sediments), Peterson (used for hard bottom material) and Ponar (used for fine-grained to more coarse sediments) grab samplers.

- 1** Label the sample containers with site identification, sample type, sampling method, sampler ID, and the date of collection. Record the following site/sampling information in the field sheet/book during the sampling process: target and actual sampling location (GPS, date and time of sample collection, overlying water depth (m); weather conditions, sampling personnel, macrophyte growth and any deviations from the field sampling procedure.
- 2** Ensure that the dredge jaws open and close properly.
- 3** Lock the dredge jaws in the open position and lower in a controlled fashion to the lake/river bottom. Do not allow the sampler to “free fall”. The sampler should be in contact with the substrate or positioned just above it.
- 4** Drop the messenger (if applicable) and slowly raise the

sampler off the bottom to prevent loss of fine sediment and then raise the dredge to the water surface.

**5** The sample is deemed acceptable if the desired depth of penetration has been achieved; and the sampler has completely closed and was not inserted on an angle or tilted upon retrieval. If the sample does not meet these criteria the sample should be taken again close to the original sampling location. The rejected sample should be discarded in such a way that it will not affect subsequent sampling efforts. The actual achievable penetration depth depends on the nature of the sediment and the sampling device used. A minimum penetration depth of 6 to 8 cm is recommended for surficial sediment samples but the preferred depth is 10 to 15 cm. These depths ensure minimal disturbance to the upper 2 to 5 cm of sediment that will be removed from the grab sample and submitted for physicochemical analysis.

**6** Record the following sediment measurements/observations (where applicable): grab penetration depth, depth sub-sampled, type of material (sediment type, colour, moisture condition, density, and grain size), biological structure (e.g. shells, large tubes, biota, macrophytes), debris (e.g., wood chips, plant or other fibres, obvious signs of anoxia (e.g., black layers), degree of sample disturbance, obvious odour or oily sheen, and other unusual properties.

**7** Siphon off any water on the surface of the grab sample with a syringe, if the water is cloudy allow it to settle first (use a new syringe for every site). Remove the upper 2 to 5 cm of sediment (according to study design) with a stainless steel or Teflon implement and transfer to a stainless steel/plastic tray/bowl. Avoid sediment at the edges of the grab sample (touching the grab sampler).

*preparing  
the sample*

**8** If more sediment is needed to obtain the necessary volume for analysis, continue collecting grab samples from the same site in undisturbed sediment. The composite sample tray/bowl should be covered while grab samples are being collected. The number of grab samples collected to form a composite sample should be noted.

**9** Wash the dredge off in the site water. Rinse bucket and ladles before and after each site in the water body.

**10** Once sufficient sediment is collected, stir (homogenize) the composite sample for 30 seconds, then transfer into the appropriate pre-labeled containers with a stainless steel or Teflon implement.

## Other sources

B. C. WLAP (2003), Environment Canada 2006 (a)



Photo 14. Transferring sediment samples to containers  
(Courtesy: Darcy McDonald Alberta Environment)