

Collecting sediment samples

Objective

There are several objectives in this section of the **Sediment module**.

- Collect surface samples of estuary sediments and sediment cores.
- Collect samples from different depths in sediment cores using standard methods.
- Learn how to correctly store the samples if you do not intend to analyse them within a week or so of collecting them.

Background

If you suspect that the types of sediments building up in your estuary are changing, you may want to collect surface and below-surface samples of estuary sediments at your monitoring sites to measure particle size and/or pollution levels in these sediments. This type of information can be useful to help explain why habitats and plant and animal communities may be changing. As explained in the **About this Toolkit module**, you should generally collect sediment samples in as many different habitats and sites as possible as part of your **baseline** survey so that you have a comprehensive snapshot of your estuary at a moment in time. This baseline information provides a way to measure how the estuary is changing over time. You can then select some of these sites to include in your regular monitoring but with the ability to re-survey some of the other baseline sites as the need arises. Make measurements at least once every year at the same time of year and also after storms, which deliver most catchment sediments to an estuary. Fresh storm deposits can be identified by their yellow/orange colour.

Sediment cores provide a way to measure changes in sediment properties over time. As you dig deeper into the sediment, it is like looking back in time, as you see evidence of past events. Scientists use cores to reconstruct the past histories of estuaries. Intertidal flats are good places to collect sediment cores because they are easy to access and are usually places where sediments and pollutants accumulate. Avoid intertidal flats that are very sandy. This indicates that finer sediments and their associated **pollutants** are not accumulating at that location. Sometimes a thin layer of sand can cover more muddy sediments below, so check the site first by digging a hole.

Links to other modules

- Habitat Mapping module
- Plant module
- Shellfish module
- Fish module

Summary of method

Collect some sediment from the surface of your estuary and/or use the coring method to collect below-surface sediment samples.

Equipment needed

- GPS or compass to locate sites.
- Spade and trowel.
- Camera (optional).
- Tape measure (5 m long).
- Clean sample containers with lid or zip-lock bags, and permanent marker pen.
- Sample labels (an ice cream container lid cut into little labels works well).
- Sediment core - we recommend 8-10cm PVC stormwater pipe or similar), end caps for pipe, and electrical tape. You will need one pipe for every sediment core you want to sample. You can purchase the pipe and end caps to seal your core from plumbing supply shops.
- Circular saw or handsaw for cutting pipe.
- Sharp knife, metal spatula or steel ruler and a small spoon.
- Old rag.
- Datasheet: "Sediment type".

Data collection and management

Enter the data collected into the "Sediment type" datasheet.

How to: Collect a surface sample

- 1** Label the outside of the sample container (not the lid) or a clean zip-lock bag, using a permanent marker pen. Record the following sediment sample details, location, site name and number, date, and the person who collected the sample on the label (e.g., Kaipara Harbour, Otamatea marae, Site 1, 17/03/2015, Emma Waitai).
- 2** Use the permanent marker pen to also label a small piece of plastic with the same sample details and put this into the sample container or zip-lock bag.
- 3** Lastly complete section 1 and 3 of the "Sediment type" datasheet. Now you should be ready to collect your sediment sample.
- 4** Scrape the top 2 cm of the sediment into the sample container or zip-lock bag and seal. Make sure you collect about one full cup of sediment so you have enough to analyse. Also make sure that you consistently collect only the top 2 cm of sediment.
- 5** Add two tablespoons of clean tap water to the samples when you return home to stop them drying out. Be sure to reseal the containers or bags. Store the samples in a covered cardboard box or similar in a cool dark place, such as your garden shed or garage.
- 6** If you intend on getting the samples tested at a laboratory for pollutant levels (see "**Sediment pollutants**" section of this module) keep the samples frozen until they are analysed.

How to: Collect a sediment core

Sediment cores provide a way to sample and preserve the sediment layers that you observe at your monitoring sites. The method described below involves pushing the pipe down into the sediment. This 'push-core' method can be used to collect cores up to about 70 cm long – about the reach of your arm. This push-core method works well in mud. If the sediments that you are trying to sample are sandy, it can be difficult to drive the PVC pipe into the sediment. Alternatively, dig a shallow trench and sample sediments at different depths (similar to the method "**How to: collect a surface sample**") directly from the side of the trench, putting your samples in clearly labelled plastic bags.

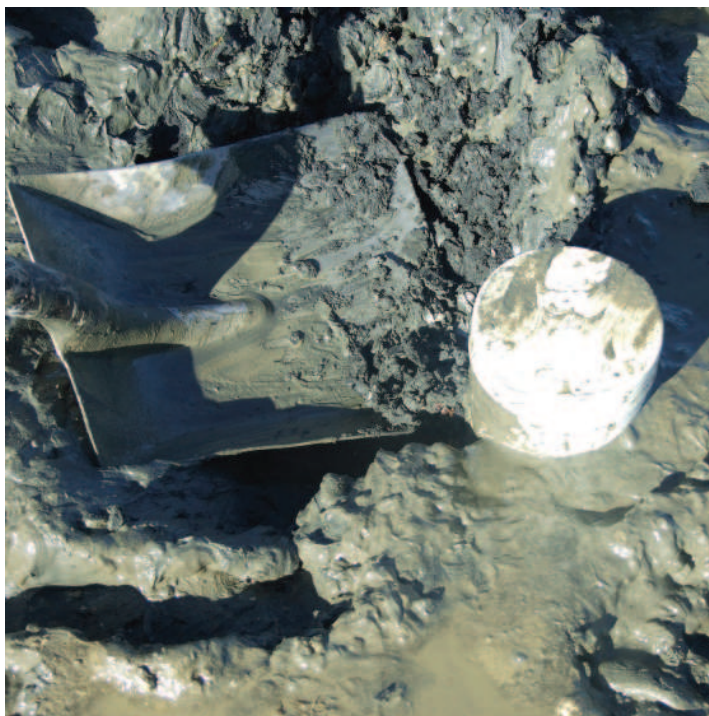
- 1 Firstly complete section 1 of the "Sediment type" datasheet.
- 2 Push the pipe straight down into the sediment all the way until the sediment reaches the top of the pipe with no air gap.
- 3 Use your weight to drive it in slowly. If the sediment is soft, you can use a small piece of plywood or similar to kneel or stand on. If the pipe is really difficult to push in you can place a block of wood on top of the pipe and use a mallet or similar to drive the core in.
- 4 Once the core is pushed all the way down until the sediment reaches the top of the pipe, dig around the top of the pipe with your hands so that you can place the top cap on the pipe.



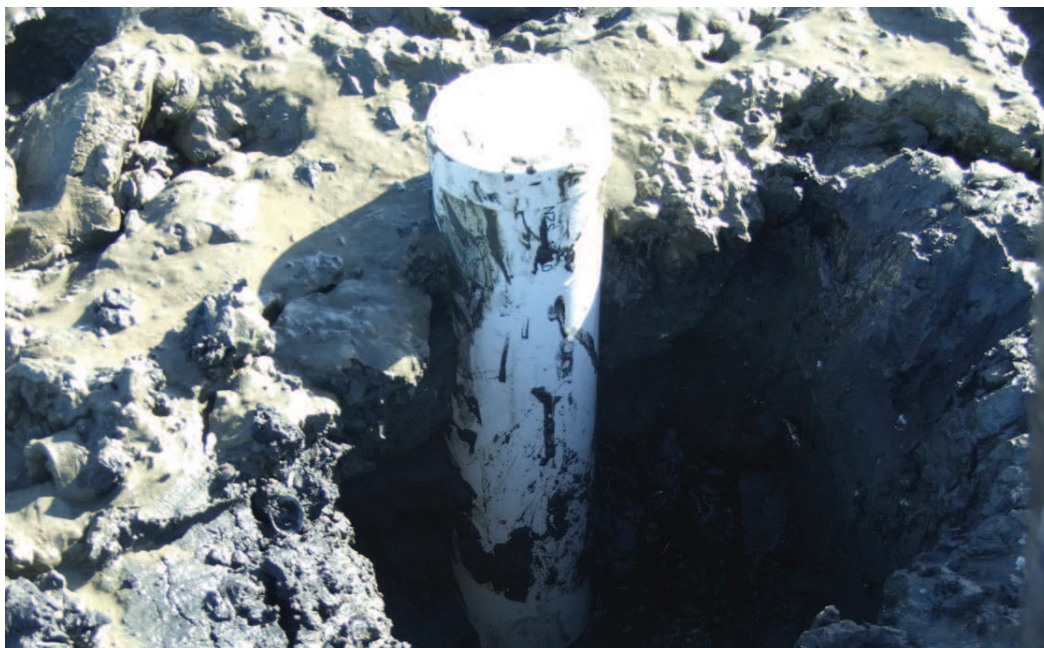
Collect a sediment core by pushing the plastic pipe vertically down into the sediment.




- 👁️ Once you have pushed the core in, place the top cap on the pipe to seal it.




- 👁️ To release the core, carefully dig around it with a spade.



 If you have problems lifting the core out, you may be able to lever it out with the spade.

- 5 Once the top cap is on, you can remove your sediment core by digging down to the bottom of the pipe.
- 6 Lift the pipe out of the hole and place it carefully on its side. Being sure to note which is the top of the core.
- 7 Use the old rag to wipe clean around the bottom of the pipe and then place on the end cap.
- 8 Keeping the core on its side, wipe the core clean and then use electrical tape to secure each end caps.
- 9 Write the site name, site number, date and collector's name on the core with a permanent marker. Clearly indicate which end is the top of the core by drawing an arrow pointing to the top (this is very important!). You can label the pipe before collecting the core as long as you remember to push it into the sediment the right way up.
- 10 When moving the cores, carry them on their sides and avoid shaking or dropping them.
- 11 Store the cores in a cool place. If you think that you may want to measure pollution levels in the cores (see "**Sediment pollutants**" section) and you do not intend to have them analysed immediately, then you will need to keep the cores frozen.



 Be sure to carry the core on its side, so that it doesn't fall out of the plastic pipe.

Processing your sediment cores

If you want to measure changes in particle size or pollution levels at different depths in your cores, you will need to open the cores and **sub-sample** them. This involves taking sediment from different layers in the core. Discuss the types of analyses that you would like to make with staff at a registered testing laboratory. They can advise you on how much sediment you will need to provide for any particular analysis. This will allow you to work out how best to sub-sample the core. For example, a 1 cm thick slice of sediment from a 10 cm diameter core should provide at least 40 grams of dry sediment. This is more than enough to measure most of the common pollutants that occur in New Zealand estuaries.

You will find contact details for testing laboratories listed under "Laboratories" in the yellow pages of the phone book. The International Accreditation New Zealand (IANZ) website (www.ianz.govt.nz) also provides a list of accredited testing laboratories whose technical competence and quality procedures meet accepted international standards. Refer to the methods in the "**Sediment pollutants**" section for details of how to use the IANZ website.

The thickness of the sediment slices taken from your core will also determine the time period that you are sampling. For example, if the sedimentation rate at your monitoring site is 5 mm/year then:

- a 1 cm slice (i.e., 10 mm) is equal to $10 \text{ mm} / 5 \text{ mm} = 2$ years of time
- a 5 cm slice (i.e., 50 mm) is equal to $50 \text{ mm} / 5 \text{ mm} = 10$ years of time.

You can see that the thicker the sediment slice taken from a core, the longer the time period that the slice represents. When you analyse a sub-sample for its zinc concentration (for example), you will get an average value for the sub-sample you send to the testing laboratory. In the example above, if the slice you send is 5 cm thick, then the zinc value that you get would be an average value for a ten-year period. If the slice is 1 cm thick, then the zinc value will be an average for a two-year period.

You can think of each sediment slice like the pages in a book. The more pages that you read, the more of the story you will understand. To maximise the **time resolution** of your core(s), take the smallest slice thickness that still provides enough sediment to do the measurements you are interested in.

However, the burrowing and feeding activities of many animals that live in estuary sediments – such as shellfish, crabs and worms – can complicate things by mixing sediments up and down. For example, large amounts of recent surface sediments can be mixed down several centimetres into older sediments within weeks to months of being deposited. This biological mixing 'blurs' the records preserved in the cores. Because of this mixing, it is usually not worth taking sediment slices less than 1–2 cm thick.

How to: Sub-sample your cores

- 1 If you have frozen the cores after collecting them, you will usually need to thaw them out before sub-sampling.
- 2 To sub-sample your core you will first need to split it in half.
- 3 To split the pipe in half you will need to make two cuts on opposite sides of the pipe. Use some lengths of wood to make a cradle for the core so that it does not move when you are cutting it open. Only adults should use saws and sharp knives – and be sure to use safety glasses.
- 4 Using a saw cut the plastic pipe top to bottom along its entire length, on both sides. A simple way to make this cut is with a circular saw set to slightly less than the thickness of the pipe wall (this will avoid damage to your sediment core and the saw blade).
- 5 Use a sharp knife to carefully cut through any remaining pipe along the saw cuts.
- 6 Once you have finished the side cuts on the plastic pipe, use a metal spatula or steel ruler to split the core into two equal halves by running the tool through the sediment and prising the two halves of the core apart. Always move the blade straight across the core so you don't move sediment up or down the length of the core.



Once split in half, the sediment core can be sampled.

- 7 Once you've separated the core, place one half to the side. Lay a tape measure along the remaining half of the core with the zero mark lined up with the top of the core.
- 8 Using a knife or steel ruler mark the sediment at the depths you want to sample. For example, you might select 1-cm slices at the following depths: 0–1 cm, 5–6 cm, 10–11 cm.
- 9 Cut down through the sediment and use the knife or a small spoon to remove the slice. Put the sub-sample into a clean and clearly labelled zip-lock bag or sample container with lid.

- 10 Label the sub-sample with the location, site name and number, date the core was collected and sub-sample depth.
- 11 Your sub-samples are now ready for analysis.
- 12 If you intend on getting the sub-samples tested at a laboratory for pollutant levels (see "**Sediment pollutants**" section of this module) keep the samples frozen until they are analysed.
- 13 Also keep your cores at least until you get back the results of any analysis. You may wish to resample the core based on the results you receive.
- 14 Once you have split your cores in half and completed your sub-sampling, wrap the core halves with glad wrap to keep them intact.