

Monitoring deposited fine sediment in rivers

Deposited fine sediment is the fine sand, silt or clay (less than 2mm wide) that settles on the bed of a river. It occurs naturally through weathering processes, bank erosion and water movement, but can increase due to human activities.

The natural levels of deposited fine sediment will vary for a number of reasons, including source inputs, surrounding geology, stream size, land slope and amount of rainfall in the catchment.

However, activities such as agriculture, horticulture, forestry and earthworks can increase the amount of fine sediment that enters a river.

Why do we monitor deposited fine sediment?

While sediment in rivers, streams and lakes is a natural occurrence, too much sediment can have negative impacts on the aquatic communities living there. Deposited sediment fills in the spaces between cobbles where insects and fish live and lay eggs. When these spaces become too clogged up, some insects can become smothered while others have feeding and growth rates affected as food sources are depleted, and there are fewer areas for fish to lay eggs. Too much deposited fine sediment can therefore change the composition and diversity of biotic communities¹.

High amounts of deposited fine sediment can degrade aesthetic values and impact recreational use of rivers

and lakes. The sediment may also be contaminated with heavy metals or contain nutrients which, under the right conditions, can be released back into the water column and/or make their way back into the food chain.

Deposited fine sediment is one of the compulsory attributes in the National Policy Statement for Freshwater Management 2020 that measure the ability of water bodies to support healthy ecosystems. Monitoring deposited fine sediment is important to determine whether sediment is likely to be causing detrimental impacts, and long-term monitoring at a site is useful for detecting any improvements that might be attributable to mitigation projects.



¹Clapcott, J.E., Young, R.G., Harding, J.S., Matthaei, C.D., Quinn, J.M. and Death, R.G. (2011) *Sediment Assessment Methods: Protocols and guidelines for assessing the effects of deposited fine sediment on in-stream values*. Cawthron Institute, Nelson, New Zealand

How do we monitor deposited fine sediment?

Methods for monitoring deposited fine sediment include:

- i. Visual assessment – estimating the amount of deposited fine sediment covering the stream bed either from the bank or using an underwater viewer.
- ii. Shuffle index - involves placing a white tile on the streambed in run habitat, standing 3 m upstream and disturbing the substrate by your moving feet vigorously for 5 seconds. A score from 1 (little/no sediment) to 5 (excessive sediment) is then recorded depending on the visibility and duration of the resulting plume in relation to the tile downstream. The process is repeated twice at each site.
- iii. Quorer – involves placing an open-ended cylinder into the substrate, measuring the water depth within the cylinder, disturbing the surface of the riverbed, and estimating the depth of disturbed (sediment-laden) water within the cylinder.

The process is repeated at five points. Water samples are taken of the disturbed water, along with a pre-experiment sample (as a control). Samples are frozen and analysed in a laboratory for suspended and volatile solids.

- iv. Wolman pebble count – using a gravelometer to measure the size of at least 100 randomly selected substrate particles from run habitat, to work out the percentage of different substrate sizes including fine sediment.
- v. Sediment depth – measuring the depth (mm) of sediment in run habitat by taking the average of at least 20 readings per site.

For more information on deposited sediment and how to collect samples, refer to:

<https://www.envirolink.govt.nz/assets/R4-1-Sediment-Assessment-Methods-Protocol-and-guidelines.pdf>



Using an underwater viewer to visually assess deposited fine sediment cover. Photo credit: J. Milne.

How much will it cost?

The cost of collecting and processing sediment samples will depend on the type of sampling undertaken and level of output data required.

For carrying out visual assessment of deposited fine sediment cover, an underwater viewer will be required. These cost about \$150-200. For taking samples, various equipment may be required: a quorer bucket, which can be easily made by removing the bottom from a 20 L plastic bucket (cost around \$25), or a gravelometer, which will cost up to \$300. In addition, sampling jars and labels may be required, at a cost of ~\$50 per site. It usually takes about half to one hour to sample deposited sediment at a site, depending on the method used, plus travel time.

A number of laboratories in New Zealand are able to analyse deposited fine sediment samples. The cost is currently ~\$20 per sample to analyse for each of total suspended solids and volatile suspended solids.

For more information on the costs associated with carrying out a monitoring programme, see the Monitoring Costs document on the Monitoring Freshwater Improvements website.



Carrying out a sediment assessment using the Wolman pebble count method.

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