Hill Country Sediment Trap - Farmer "Cheat Sheet"

Background

1. Sediment traps have a long history of being used in hill country to reduce sediment loss from tracks or eroding areas within a farm.
2. However, there is very little research regarding their effectiveness or optimal design.
3. Through the Our Land and Water National Science Challenge three farmers (Nelson, Foss, and Proffit) at Aria constructed a sediment trap on their respective hill country farms and in conjunction with Massey University measured the sediment that was captured. This sheet is a summary of the construction phase.

Figure 1: Sediment trap for 3.6 ha catchment

4. The aim of the farmers involved in this project was to come up with a small and practical solution that other farmers could relatively easily implement to help improve water quality on-farm.
5. Some further related reading can be found at:
   - https://www.dairynz.co.nz/media/254172/5-9_sediment_traps_2012.pdf
   - https://nzarm.org.nz/vdb/document/23
   - https://nzarm.org.nz/vdb/document/25
   - http://www.wet.org.nz/wp-content/uploads/2012/03/COARSE_SED_TRAP.pdf
   - https://doi.org/10.1002/hyp.14309
   - https://atlas.boprc.govt.nz/api/v1/edms/document/A3262395/content

Choosing the site

6. The aim is to have several small sediment traps instead of 'one big one' – this is for effectiveness, aiming to stay within relevant council permitted activity rules, and cost considerations.
7. The ideal target is for your sediment trap to have 120 m^3 of storage per one hectare of catchment. However as can be seen in Table 1 this target was not the on-farm outcome achieved by our three farmers and sediment was still captured:

Table 1: The sediment trap capacity achieved by our three farmers

	Catchment area	**Estimated size of sediment trap**	**Ratio – m^3/ha of catchment**
Farmer 1	3.6 ha	390 m^3	108 m^3/ha
Farmer 2	20.3 ha	850 m^3	42 m^3/ha
Farmer 3	15.0 ha	1,300 m^3	87 m^3/ha

8. Identify as bigger flat an area high up the catchment as possible, so the catchment area does not get too big.

9. Be aware of your local government regulations so your sediment trap does not trigger a resource consent requirement.

Getting your pipes organised

10. The aim is for the sediment trap to empty within three days to allow pasture recovery, to be able to handle the next event, and to avoid creating a new permanent water body. The 'riser pipe' is the key tool in achieving this outcome.

11. Diagram of a riser pipe set up:

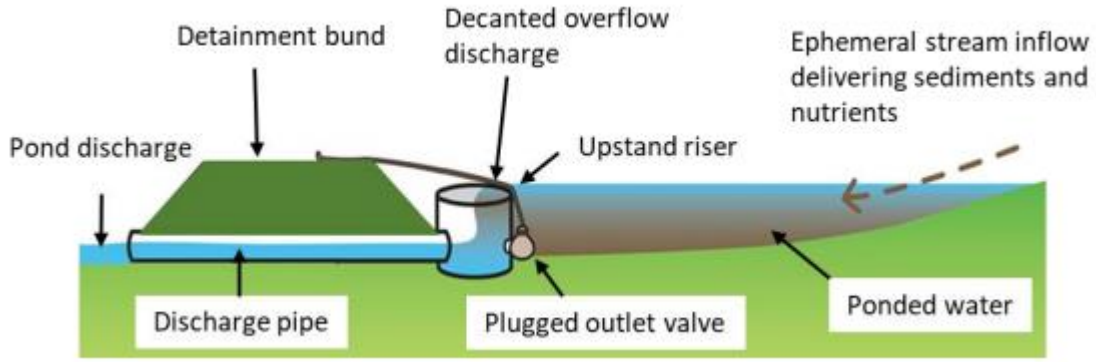

Figure 2: Diagram showing the stream inflow ponding behind an earthen wall or detainment bund used on good contoured land on pumice soil with a plug system in the riser pipe. Acknowledgement: John Paterson and Brian Levine.

12. Using a laser level like builders' use, makes getting the heights easier.

13. Get the outlet pipe and riser constructed in your sediment trap early in the process so if the rain comes you do not end up working in a 'pond'!

14. The outlet pipe size should increase as the catchment area increases (Figure 3).

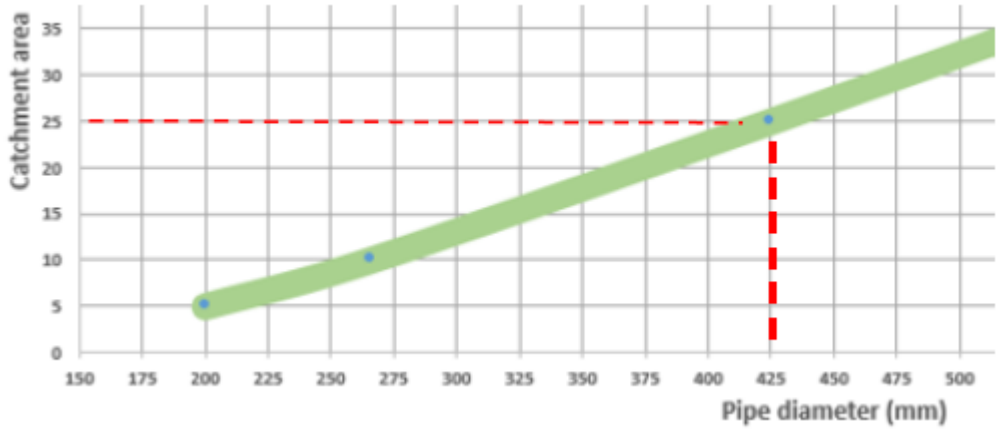

Figure 3: Suggested size of outlet pipe for different catchment area. Source Paterson et al. (2019)

15. For inlet holes, the farmers found two 25 mm holes every 200 mm of riser pipe height worked well.
16. For the outlet pipe it was easy to make a little hole bigger (with a sledgehammer)! But take your time and don't make the hole too big as we found the hardest thing was to seal up a big hole. Use concrete and wire for reinforcing or sandbags with cement mixed in.

Figure 4: Paired inlet holes every 200 mm are visible with exit pipe at the bottom of the riser pipe

Site preparation

17. Do this in summer so you are not working in a flowing watercourse. This will allow more time for new grass to establish as exposed soil is not the desired outcome.
18. Make sure you have a firmly packed high rainfall event overflow.
19. You need to have the riser pipe close to your sediment trap wall as this makes access to clean and check it easier and safer.

Site maintenance

20. Remember if your sediment trap is built properly and working well you will have to remove some silt over time - as this will be accumulating and will reduce the dam's capacity.
21. You need to check and occasionally clean and unblock the little holes in riser pipe.

Health and Safety

22. Be very careful with young children.
23. Add the sediment trap to your farm hazard list and include a mitigation plan to make it as safe as possible.
24. Take care when doing site maintenance and communicate with someone prior to going to the sediment trap. Two people on site would be best practice.
25. The wall of your sediment trap needs to be fully compacted considering the soil type you are working with.
26. The top of the rise pipe should have a mesh cover to prevent debris and stock getting sucked in.

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