

Climate School 180

Water management options for your school grounds

Introduction

This document will provide you with a range of nature-based (and other) solutions for helping to manage water in your school grounds – whether that’s flooding or drought.

Here we provide you with an overview of the types of solutions you could add to your grounds. You can use this information to help you plan change to your grounds that will help solve your water management issues.

Some of these you will be able to implement yourselves but other may require additional professional advice e.g. if you have persistent flooding problems.



Heavy rain and flooding

Remember, when thinking about storm water management, the following three words sum up what you are aiming to do to the excess water:

- Slow
- Spread
- Sink

In other words, you want to slow down the travel of water so that it hits the ground over a longer time period, giving the water more time to be absorbed rather than running away. You also want the area it reaches, both directly and indirectly, to be bigger giving a larger area for it to be absorbed across. And finally, you want as much as possible to sink into the ground, providing water to plants and natural underground storage, rather than running away into the main drainage system.

Below are a range of solutions that can help with heavy rain and flooding. We recommend reviewing each of these at the 'How can we get there?' stage of the LtL process of change, to see which is the best option for each problematic area of your grounds.

Sustainable Drainage Systems (SuDS)

SuDS are methods for managing water that take into account water quantity, biodiversity and amenity, which in schools could include play and learning.

Many different features can be included as a SuDS such as:

Swales – are a shallow, linear, open channel used to help manage excess rainwater. Water can freely flow through the swale into another drainage system, but in doing so water is slowed and sediment is retained. Swales are dry outside heavy rain events. Swales can be planted or just mown grass.

Filter / French Drains – are closed drains with a permeable layer above to allow water to flow in freely. These are often found on sports fields or close to buildings. The permeable layer is often gravel and traps sediment while allowing water in.



Detention basins / flood basin – is similar to a swale but has a controlled outlet. They are designed to hold water for a few hours and control the rate of release. Basins can be planted up or have mown grass in them.



Soakaways – are buried pits or tanks which can hold water underground during periods of heavy rain or floods. The advantage of a soakaway in a school is that the water is inaccessible and therefore safer.



Stormwater planters – these are designed to not only use rainwater for watering the plants but also store water within them, meaning there is water available at periods of draught. They also should have overflow systems that ensure the plants don't get drowned.



Rain gardens – these are shallow areas of ground into which water runs off from the land around and flows out again freely. The rain garden is planted to further absorb and slow water. They need plants centrally that can withstand some waterlogging and plants around the edges that can cope with drought. Some rain gardens are built as raised beds, connected to drainpipes from buildings.



Bog Gardens and wetlands – these typically stay wet or moist between rain events. A bog garden can dry out, but typically has moist soils and plants adapted to be standing in water. A wetland has more ponds and standing water, which does vary in level depending on rainfall, but rarely or never dries out.



Channels in paving – these are designed to only fill with water after a rain event. These can be used for play and learning as well as managing the water flow.



Permeable surfacing – wherever possible, increase the amount of surfacing that is permeable. This is probably the change with the biggest impact as far as flooding is concerned. This can ensure that water drains into the ground better or can be used to filter into an underground storage system so that the water can be used elsewhere on the site. It can be expensive but if you are replacing or upgrading hard surfaces on site do look at where permeable surfaces can be used instead.



Green roofs can help with reducing the impact of flooding and blue roofs (water features on a roof) are possible too. However, you always need to check that your roof is strong enough to take any of these features as water and wet soil both add a great deal of weight. Green roofs also add to biodiversity and can help cool your buildings in the summer and insulate them in the colder months.

All these systems require some maintenance so make sure you understand what will be needed as they develop. This could be less than existing maintenance, but you need to discuss any changes with whoever manages your grounds before alterations are made. Also consider where you are to place these systems. Is there water runoff into your grounds from outside your site? If so, you could create perimeter rain gardens and vegetated swales, but you will also need consider the quality of the water. If the runoff is from a nearby road then this could be highly polluted, including high levels of salt in the winter months. SuDS can help prevent that pollution spreading further afield by trapping it in the system.

Reducing impermeable surfaces

Many schools have large areas of tarmac or concrete which are impermeable. ‘Depaving’ can have the greatest impact on flooding of any changes you make but can also be expensive to take up and replace. So, when the time comes to replace this surfacing consider whether all needs to be tarmac – maybe you don’t need as much of this surfacing as you have now. You can get semi-permeable tarmac although that too is expensive but do see if you can compare the prices to find out if a change is possible.





There may be areas of your grounds that do not need tarmac or other hard paving, and an alternative could be used instead. This could include paths, seating areas, social spaces, bike storage spaces or even car parking areas. Alternatives include bricks with holes in, sand, shells, gravel, bound stone, grass (with different types of reinforcement) or bark chip.

Schools can also temporarily add in planters and raised beds onto hard surfacing. These can be created in a variety of ways but then filled with soil and plants to catch and slow down the rainfall.



Planting to help with water management

Planting trees, hedges and other vegetation can help you reduce the impacts of heavy rain in several ways. Firstly, the rate of the rain reaching the ground is slowed down by passing through the plants, getting deflected or stopped by the branches and leaves on the way. Some water will also run down the trunk of a tree and there will be some water that gets straight through. However, the overall effect is to slow the flow to the ground.

The next aim is to spread the flow and let the water sink in. Again, planting helps with this as the leaves and branches deflect the water across a slightly larger area.





Often unseen, are the deep and wide roots from a diverse range of plants and trees providing pathways for water to sink deep into soils. Between the canopy spread and root spread, we can absorb significantly more water than mown grass or bare earth.

Make sure you go for a variety of plants, shrubs or trees, as the differences in root type and leaves is vital to a system which manages water.

Good soil health

This might not seem an obvious water management solution, but your soil is likely to be your biggest water storage feature on your site. A healthy soil can also cope with flooding a lot better than a compacted soil. A healthy soil will absorb rainwater whilst a soil that is compacted will not allow water to run through it, instead it runs off the surface increasing the flooding impact. This also happens when soil is waterlogged or has been dry for some time, especially if there is heavy rain. In both cases the water cannot penetrate the soil and flooding can occur.

Increased organic matter improves soil structure. This increases its water holding capacity and acts as a sponge to retain water for longer, helping to cope with drought conditions as well as flooding.

A layer of mulch on the top of your soil helps to retain water by reducing evaporation from the soil, as well as helping to control weeds. Cardboard can also be used as a mulch, dampened down and topped up with a further layer of compost or mulch. Both mulch and cardboard will break down and add to the organic matter in your soil over time. Shaded soil also has slower evaporation rates of water, so planting can help retain moisture in the soil.





Choosing the right plants, shrubs and trees

Plant selection for different conditions and purposes is important. By using a variety of plants, shrubs and trees we create different root structures in the soil. You can create a planted area which has something growing actively in all seasons, robust in times of drought or excess rain, and much more likely to manage water well on your site. Take local advice as to what plants you should use but do ensure that variety.

Introduce meadow areas

Instead of typical amenity grass covering all areas of the school grounds, consider creating areas which are herb or flower rich which have deeper rooted grasses.

There are two options here, both of which are based around soil which can absorb more water through a diversity of grass and meadow plants having deeper roots. The average meadow has roots which are 50cm-150cm deep, compared with typical amenity grass which is 5-20cm deep.

Actively plant areas of herb or flower rich meadow areas. These are not wildflower areas, instead they contain mixes of plants and grasses which have an all-round benefit to pollinators and soil health. You can plant into existing grass areas and can continue to add to the planting each year. This is a faster and more reliable way of establishing a more diverse meadow area. You will require some local advice and an understanding of which soil type you have, but this is an excellent learning opportunity for pupils.

You can also stop mowing areas. This works well in allowing growth to rapidly take place, and it will deepen some roots. Without fresh seeds being introduced a few stronger plants will dominate the plants you have but this method is simple and easier to implement.



Whichever route you choose, you will need to work with the schools grounds maintenance teams. They will need to understand what you are trying to achieve and agree to new mowing regimes.

Plantlife have an excellent guide to meadows here- <https://www.plantlife.org.uk/learning-resource/managing-meadows/>



Slowing rainwater and storing rainwater

A significant proportion of your site is actually the roof of the building. Usually, rain falling on a roof is diverted through the downpipes and straight onto the floor and into drains. You can delay this water reaching the ground by using water butts or similar devices, and that rainwater can then be used for watering plants. Rainwater storage does need some thought as there is a likelihood of Legionella bacteria forming, and a possibility for Leptospirosis to be transmitted into the water. All rainwater

should be treated as 'grey' water, meaning it is not fully clean and definitely not for drinking or play. However, with some simple procedures the risk can be reduced to an acceptable level.

You must;

- Keep your stored water below 20*c, out of direct sunlight. You can use the building for shade or build shade around the water butt.
- Clean / flush the water butt and accessories twice a year. We recommend using products used for cleaning freshwater caravan water tanks such as Elsan Water Purifier as it is not harmful to children or plants at the low level of dosage.
- Consider drilling a very small hole at the lowest level of any water storage tank so that the tank will slowly empty – but water will not stand for weeks in a period of hot weather. If not, empty your water into the garden early on in extended heat waves.



- Use a watering can not a hose, and do not use a 'rose head' to sprinkle water.
- Do not allow water play with the collected water, only plant watering.
- Wash hands after using collected rainwater.

Monitoring water as a learning resource

Your school grounds climate audit will have helped pupils consider where the areas of drought or excess water is in your school grounds. It is worth extending the conversation to think why this is the case. For example, do you have water flowing onto the site? Perhaps it is gathering at a low area and the drains are blocked. Maybe your soil is compacted from all the people walking in certain areas.

It is a good idea to have ways of measuring precipitation on your grounds. Simple rain gauges can be used, or even made by pupils so that they can see the pattern of rainfall throughout the year. This will also help to see if weather patterns are changing and how the school might need to adapt to those changes in their grounds. These can be compared with Met Office forecasts and readings too.

Checklist of considerations when planning water management

Issue and impact	Reason (there could be other reasons in your school)	Possible solutions (Some of these solutions will require professional advice and help to implement, some will be able to be completed by the school or grounds maintenance staff)
Flooded or very muddy sports fields	Compaction from heavy use and/or poor maintenance of the grass and soil	- Ensure maintenance is carried out regularly and correctly - This should include maintaining drains and aeration of the pitch
	Heavy clay soil	- Grass with deeper roots, aerate and top dress the grass with soil and sand.
	Where water runs to from other areas of the site e.g. a higher MUGA or all-weather	- Create small swales or use French drains to divert water. - Use planting, both meadow / unmown areas, and trees, shrubs plants to



	pitch, or other hard surface	improve soil drainage in specific areas.
	Poor drainage because of what is under the soil (e.g. old buildings under the surface)	- Use planting to improve the soil. - Create small swales
	Old underground drainage system clogged up over time	- Clean or replace drainage system
Other areas of muddy grass	Pupils cut corners or create desire-lines to make journeys shorter, or pathways not wide enough for more than one pupil to walk along beside each other	- Create new paths on desire-lines with permeable but hard surfacing such as air bricks which have holes in or other permeable paving. - Encourage pupils to keep to the path using hedges, bushes or other 'obstacles'
	Overused grass areas	- Consider how the space is used as this will affect your choices. - Can you spread the use more across the site so that it isn't concentrated in one area - Can you move the heavy use to another area of the grounds, either permanently or whilst the grass recovers? - Can you create pathways through with more robust surfacing to take the pressure of the grass? - Consider changing the surfacing to something permeable but more robust such as air bricks with holes in or other permeable surfacing such as sand or bark mulch (however, the latter can also become muddy) - Consider adding a structure to the surface that allows greater use of the grass area such as plastic grids or concrete grids - Avoid using impermeable surfacing as this can increase the flooding problems - Whilst plastic grass is permeable it should be avoided where not essential due to its environmental impact



	Water dripping or flowing onto the grass from hard standing or drain pipes etc.	- Divert the flow of water from downpipes to a pond or wetland area - Create rain-water gardens to take up the excess flow. Stored water can then help in times of drought. - Install a rain butt or other water-collections system - Create a swale alongside the hard-standing area to help collect the water in times of heavy rain. - Create planting alongside the hard-standing areas to help with soil health and prevent access to the wettest area.
Hard paving flooding	Blocked drains	- Unblock or replace drains
	Not enough area for the water to drain into – e.g. not enough capacity in drains and/or because of large areas of impermeable surfacing	- Assess if any impermeable surfacing can be replaced with permeable surfacing either immediately or when due to be renewed or replaced - Look to add new drains into existing systems – such as slit drains or French drains. (Take advice from an engineer or landscape architect). - Create a swale alongside the hard-standing area to help collect the water in times of heavy rain. - Create planting alongside the hard-standing areas to help with soil health and prevent access to the wettest area.
	Increased heavy rain over time leads to flooding	- Assess if any impermeable surfacing can be replaced with permeable surfacing either immediately or when due to be renewed or replaced.
	Water storage systems full and overflow	- Ensure water storage systems have overflows into the main drainage.

Some 'How to' guides to help you manage the water in your grounds

- The LtL [Polli:Nation maintenance guide](#) has a section on managing trees, hedges and shrubs as well as a section on orchards. It describes when to undergo different management processes, why you are doing them and who could be involved in that process.
- Plantlife have an excellent meadows guide. <https://www.plantlife.org.uk/learning-resource/managing-meadows/>
- 10k Raingardens have superb guidance specifically for schools on creating raingardens. <https://www.10kraingardens.scot/school-raingardens/>
- The [National Education Nature Park](#) has produced guidance on developing a range of habitats including [ponds and other water features](#).
- There are also LtL how to guides on planting trees and shrubs which you can find at www.ltl.org.uk/climate.

For information on Sustainable Drainage Systems:

- The National Education Nature Park has information about SuDS and other water management features on its website. <https://www.educationnaturepark.org.uk/resource/add-pond-or-rain-garden>
- Sometimes the national education departments have funding for SuDS whilst [Susdrain](#) has case studies that include school grounds across the UK.

