WLI information sheet No. 1:

Wetland treatment Systems (Constructed Wetlands)

Across WWT's 9 centres we use wetland treatment systems (WTS) to treat our wastewater in a sustainable way. These wetlands have been specifically created for their ability to treat water, but also offer biodiversity benefits, providing habitat to plants and animals. They are a great example to visitors of another way wetlands can be useful to human beings, and a demonstration more widely of how wetlands could be used at sites, either domestic or commercial.

Wetlands are well-known for their water purification properties, removing sediment, nutrients, pollutants and biological pathogens. We can mimic and maximise these attributes by constructing a WTS using basic principles to create the correct conditions. WTS can take the form of a single stage bed or multiple linked stages depending on the effluent requiring treatment. In the UK WTS have an impermeable liner to protect nearby surface and groundwater sources. The beds are then filled with a medium which is either gravel or soil. Common Reed *Phragmites australis* is commonly used to plant in WTS but increasingly other wetland plant species are being used.

At WWT we favour planting a range of native wetland species which can enhance treatment but also bring wildlife and visual benefits. The plants support diverse microbial populations around their roots, shoots and leaves which are central to many of the nutrient reduction processes. Figure 1 provides a simple outline of the basic concept, effluent is fed in at one end of the bed and slowly moves either through or over the matrix coming into contact with the plants, bacteria and physical media so that water leaving at the other end contains fewer nutrients, solids and pathogens.

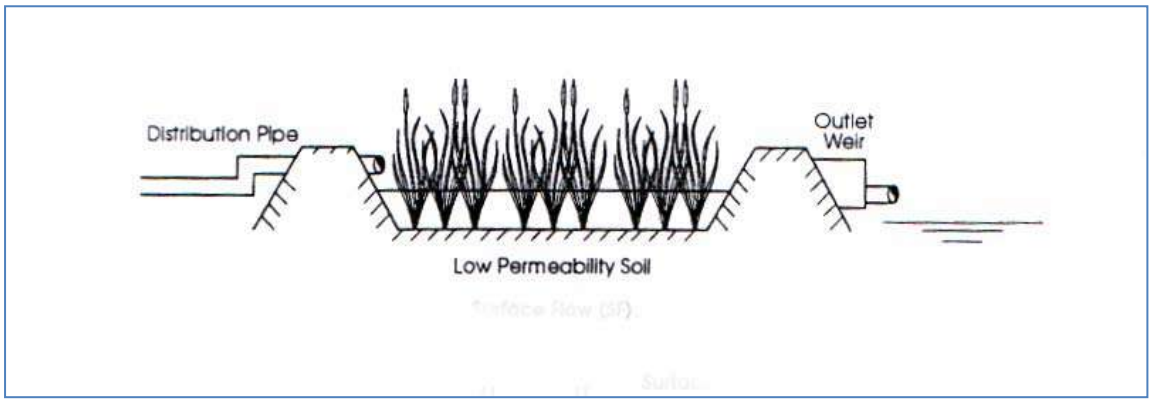

Figure 1 - Basic concept of a WTS bed

These systems do require regular management and maintenance. Typically this involves rotational harvest of the vegetation to remove nutrients and organic matter from the system. Phosphate tends to be associated with sediment particles so regular de-silting of ponds will be needed where phosphate removal is required.

Figure 2 - WWT Welney Visitors Centre

How are water treatment systems used at WWT?

To treat water coming into WWT Centres – at WWT Llanelli (Wales) we receive secondary treated sewage from the nearby Welsh Water Sewage Treatment Works. This water is already treated but as a final 'polishing' stage we pass the water through a large treatment wetland system. The system has a settlement pond and then two further treatment stages which have been planted with a range of plant species including common reed and yellow flag iris.

To treat water produced at WWT centres – the new sustainable centre building at WWT Welney uses a treatment wetland to treat all the wastewater produced from the toilets and cafeteria (Figure 2). The system starts with a septic tank which removes solids leaving the effluent to flow into one of four horizontal flow reedbeds which have a gravel matrix and are planted with common reed. From there water flows through a species rich treatment ditch and finally into a wildlife pond.

To treat water leaving WWT centres- at WWT Slimbridge a 900m2 treatment wetland was constructed in 19993. Water passing through the water bird collection pools in the centre grounds picks up a lot of nutrients form bird faecal material and uneaten bird food. This system is multi-stage comprising pools, marshes and cascades to reduce nutrients before the water discharges into a pool which is home to a family of kingfishers. It has been planted with a variety of wetland plants which increases its value to wildlife. WWT visitors have been able to watch water voles feeding at the edge of the ponds.

Top tips

- Wetland Treatment Systems are a great solution when there are no mains treatment options available
- Plant WTS with a range of plant species to encourage more wildlife- this is best kept to the final stages where water is cleaner
- They can be used for a range of effluents from sewage, landfill leachate and mine water
- They can be designed creatively to fit within the landscape

Further resources

Kadlec & Wallace (2009) Treatment Wetlands, CRC Press

WWT Consulting
www.wwtconsulting.co.uk/our-services/wetland-treatment-systems/

Constructed Wetland Association
www.constructedwetland.co.uk

Glossary

Leachate – liquid that drains through a substrate and often contains harmful substances.
Nutrients – in this case generally phosphates or nitrates.
Pathogens – disease-related micro-organisms (often found in waste water) such as bacteria, viruses or fungi.
Polishing – final cleaning of water that has had some previous treatment, often using reedbeds.

Ramsar

WLI is recognized as a key implementer of the Ramsar CEPA programme