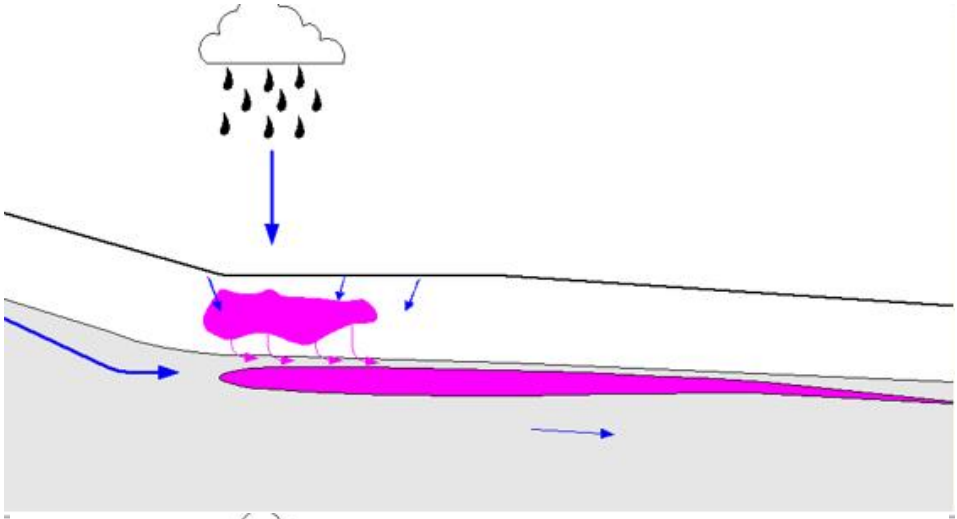
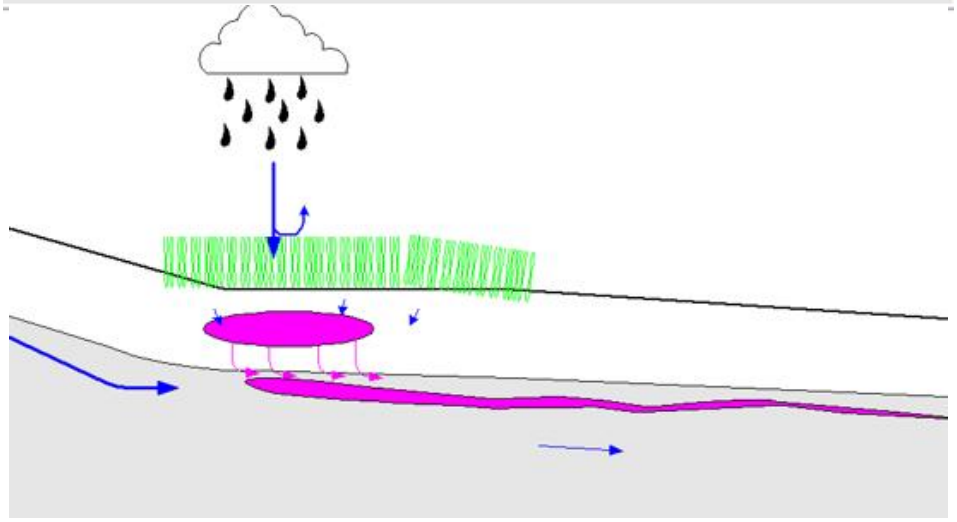
In situ sustainable soil pfas decontamination using phytoremediation

Normally, PFAS in contaminated soil is washed away by rain and groundwater



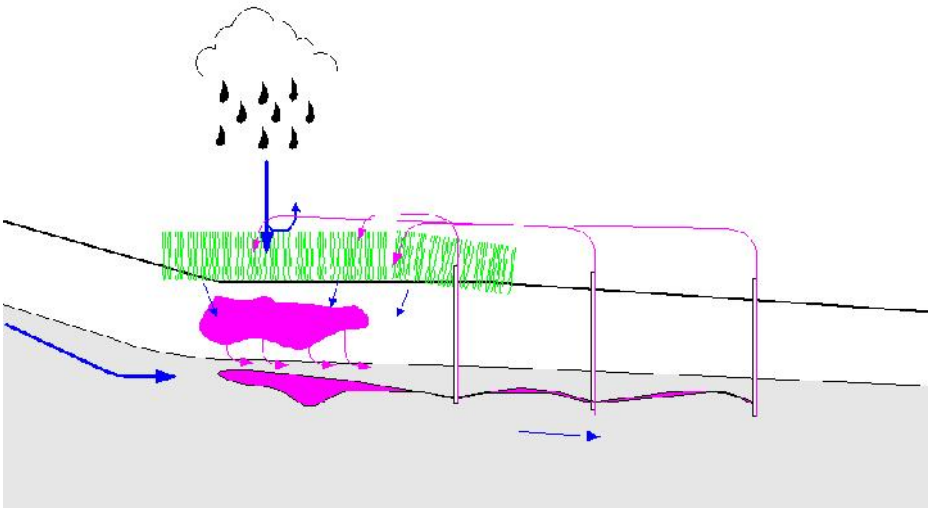
Planting e.g. willow or hemp can reduce the impact of rain washing out PFAS from the soil into the saturated groundwater zone.

In certain climates, willow has the ability to evaporate a year's rainfall. A warm windy day can evapotranspire up to 20-30mm



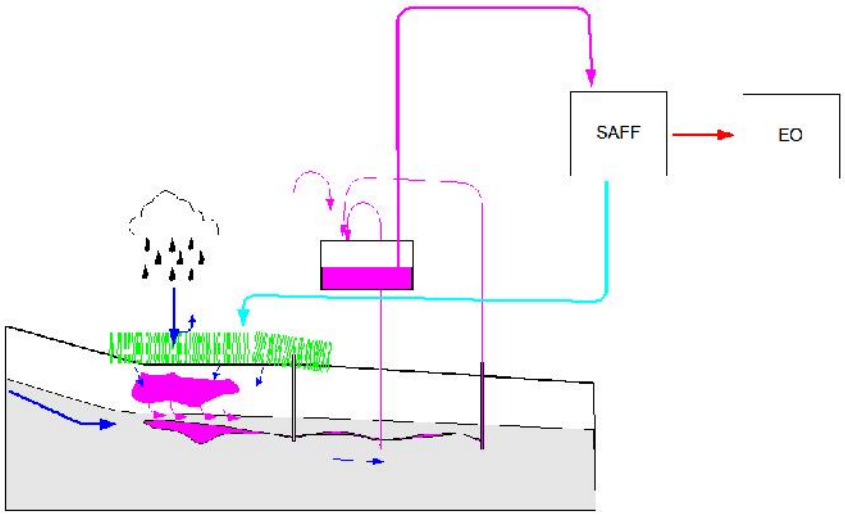
Recycling contaminated water (pumping) can prevent PFAS from spreading within the groundwater. The willow will evapo-transpire and treat part of the water resulting in cleaning the groundwater from PFAS.

Incinerating the willow will destroy the PFAS



Some of the water will not be evapotraspired and will infiltrate the soil washing out pfas into the ground water which will then be pumped back up and recirculated to the willow.

Growing Willow increases soil organic carbon which in turn helps to immobilise PFAS from washing into groundwater.



Data on the efficacy of long-term treatment is this way is currently unknown however it is estimated to be 10-100 years.

To speed up and increase the treatment efficiency, the water can be partially purified with Surface Active Foam Fractionation (saff) technology and the PFAS constituent destroyed by oxidation. It is estimated that this could reduce the treatment time by a factor of 10 to 20.

Since we only need to treat the peaks in PFAS concentrations, the equipment can be made very simple and therefore can be cost-effective.

2024-07-09

Sustainable soil washing using phytoremediation - PFAS

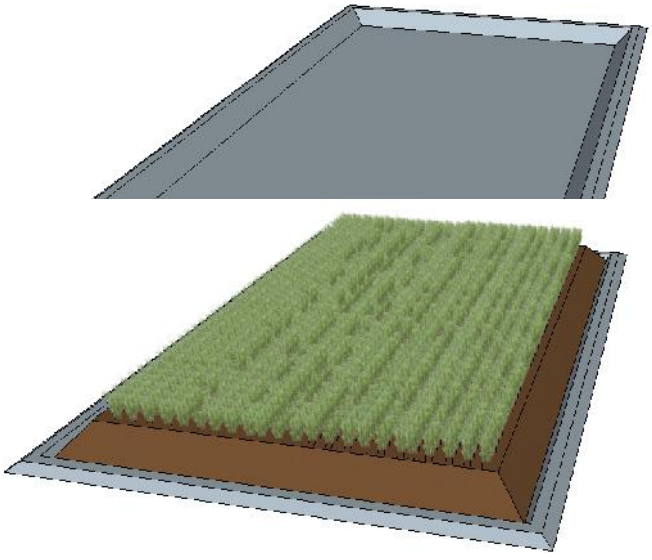
Today one of the most common methods of remediating a contaminated site is by removing the contaminated soil however the issue of where this soil goes still remains. Usually however it goes to a landfill site but the contamination is still present, it has just moved and can still be an environmental risk for contamination of surrounding water through slow leakage.

One current treatment alternative is to stabilise the contaminated soil with an additive (e.g. activated coal/biochar) but this still does not solve the long-term slow leakage of short PFAS chain molecules.

Another approach is to use phytoremediation e.g. Willow to take-up PFAS. After sufficient treatment, the soil can be reused. Several publications and reports prove the concept even if the time aspect has not been fully established.

Managing contaminated soil can be challenging in terms of regulation and control however in-situ treatment of soil can be a simper process in terms of regulation, management and permitting.

Removing the contaminated soil to an enclosed facility (closed off to groundwater leakage) and then establishing willow on it can enable rainfall to wash out the PFAS into solution for recycling to the surface where the willow takes it up through transpiration. The PFAS translocates to the stems, branches and leaves which are ultimately incinerated which destroys the PFAS. The continually irrigated water will continue to wash out PFAS from the soil throughout the growing season.



During winter, the rainfall will be stored within the facility where it will be irrigated to the growing willow once growth and transpiration recommence.

The incorporation of a simple SAFF and EO train unit will aid the destruction of high PFAS concentrations for example at the start of the first period of treatment.

2024-07-09

It has been traditional thinking that landfills are a long term sink solution for depositing PFAS contaminated soils however it is now known that PFAS can be emitted from landfills in the gaseous phase as well as via leachate in the liquid phase. Societal thinking of how best to manage PFAS therefore needs to be changed as landfills really only delay PFAS emission to the environment.