

# Flood recovery - soils

## Identifying issues with flood affected soils

The floods in early 2011 have resulted in farms in parts of Victoria being inundated with water for varying lengths of time. This fact sheet provides information about the potential issues with soils that may arise from the inundation. Farmers, particularly from irrigated and non-irrigated farming systems, will be able to use this information to identify issues as they arise.

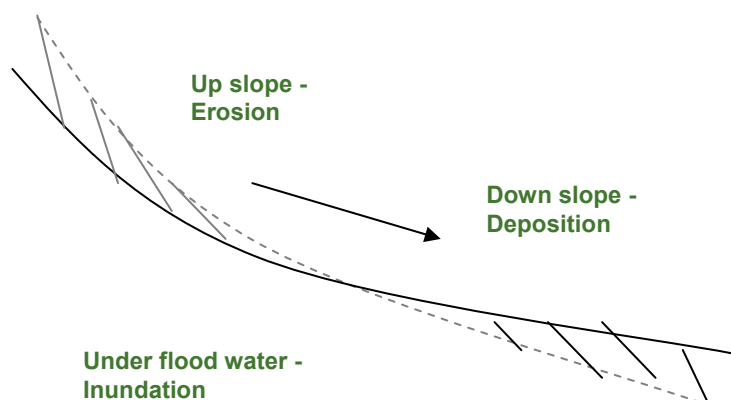
## Assessing flood damage on your property

After flooding has occurred it is important to determine, on a paddock scale, whether there is evidence of erosion, deposition or whether it was just inundation.

Erosion usually occurs on the upper slopes and deposition occurs on the lower areas such as on flood plains. As well as the issues of erosion or deposition there are also the issues arising from inundation.

The damage to soils and the management required will vary depending on whether the soil was inundated by flash flooding or by prolonged flooding which is defined as inundation for five or more days.

Water speed, depth and temperature will determine the extent of the damage. Cool, shallow water will generally result in less scalping (erosion) and less deposition. Fast flowing water generally results in less deposition however it will cause a higher level of scalping (erosion).



**Figure 1: Erosion and deposition occur depending on slope. Inundation occurs on all ground covered by the flood waters.**

## Erosion

Where erosion has occurred there will be less topsoil and a change in the nutrient levels and structure of the soil. Assess what topsoil is left in each paddock and if there is any subsoil exposed before deciding what needs to be done to re-establish the pasture.

Nutrients that are attached to the eroded soil particles are lost and are no longer available to be utilised by plants. Nutrients may be dissolved in flood water or leached through the soil profile and as a result sulphur and nitrogen losses could be high. Potassium losses may also be high however, historically, northern Victorian soils have had high potassium levels so leaching will have little effect as additional potassium will be released by the clay soils with time. This may not be the case for soils in other parts of the state.

Residual soil nutrient levels need to be determined and a nutrient budget should be completed to ascertain future applications of fertiliser to the area. Ensure fertilisers are not applied to water-logged soils because of the increased risk of runoff.

After the paddock has been drained and stabilised, sow pastures or fodder crops to further stabilise the top soil. Low temperatures or a dry period will increase the time taken for the pasture to recover or grow from seed.

Vegetation, leaf litter and organic matter may have been removed from soil and as a result the soil becomes more susceptible to further wind and water erosion. Consider removing stock from these areas while they are recovering.

## Deposition

Deposition occurs where the flood water has carried sediment from upstream or from the upper slopes and deposits it in the lower lying areas.

Deposition of fine material may cause surface sealing. This occurs when the surface of the soil is sealed and hence reduces water infiltration and aeration. This may result in anaerobic conditions underneath the sealed surface which deprives plant roots of vital oxygen.

Sodium or sodic clays may also be deposited by the floods. The sodium interferes with most crop plant growth and can cause soil dispersion. A sodic soil has a sodium exchange percentage (ESP) above six per cent.

Pastures will recover quickly from minor sediment deposition of less than five centimetres thickness. However soils with a heavy deposition of silt, sand or gravel may require further management.

# Identifying issues with flooded soils



**Figure 2: Deposition of fine soil particles after flooding.**

## Inundation

Inundation of soils over the short term is not normally detrimental. It is normally the erosion, deposition and management of the wet soil after the flood event that causes the issues.

Floods will have a greater impact on soils with poor structure because the water is slower to drain from the soil profile. Thus, it is not the flood but the waterlogged soils that cause detrimental effects on plant survival and growth.

Trafficking should be kept to a minimum on waterlogged soils to ensure there is no damage to soil structure by pugging and subsoil compaction. Pugging is more likely to occur if the watertable is closer than 20 centimetres to the surface.

Flooding will cause ground water to rise, especially in coarse textured soils such as sandy loam soils. If the watertable is less than two metres below the surface of the soil and it has an EC >3500  $\mu\text{S}/\text{cm}$  then salinisation may become a problem.

Salinity is a catchment scale issue whereby the groundwater table rises and evaporates concentrating salt at the surface of the soil. The salt at the soil surface reduces plant growth of sensitive species.

Monitor ground water depth and EC levels by inserting a PVC pipe into the ground.

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Anaerobic conditions will change the soil chemistry and can result in the release of toxic levels of manganese, aluminium and hydrogen sulphide which can cause root death.

Soils that are susceptible to slaking and dispersion, such as hard setting soils, are more prone to damage after flooding.

## Transported seeds and chemicals

Seeds are transported in flood waters. Monitor weed growth in deposition and inundated areas, especially areas containing bare ground where there is less competition from other plant species.

Chemical residues can also be transported by flood waters. For further information refer to Information Note AG0889 - Guidelines for Sampling Soils, Fruits, Vegetables and Grains for Chemical Residue Testing on the DPI website.

## Recommendations

Soil test those areas affected by flooding after they are drained to determine how much nutrient has been lost by erosion, leaching or diffusion. Prepare a nutrient budget to ensure future fertiliser applications are correct and will give you value for money. Do not apply fertiliser to waterlogged soils due to the risk of runoff.

Delay machinery or animal traffic until soils have drained and soil strength has re-established. Damage caused by compaction can be difficult to repair and can carry over for many seasons.

## Further References

Flood recovery, pasture regrowth, resowing and the use of summer fodder crops refer to 'Recovery of pastures after floods' on the DPI website [www.dpi.vic.gov.au](http://www.dpi.vic.gov.au)

Refer to your local consultant or DPI extension officer for information on suitable management practices for erosion, deposition and inundation appropriate to your soil types.

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