



A technical background and primer about Eclipse Soils' Aquamor Mulch™

What is mulch?

A mulch is a layer of material on the surface of a growing medium. Mulches have three main uses:

- to reduce evaporation;
- to alter soil temperature; and
- to reduce the number of weeds,

through the lowering of soil temperature, and improved conditions for soil microflora and microfauna.

Reduced evaporation

Mulches reduce evaporation, firstly by shading the soil and secondly by slowing the movement of water vapour and liquid (wicking) from the soil to the atmosphere.

Evaporation from the bare surface of a medium draws water from below, as though through a wick, if the columns of water are unbroken. A main effect of a mulch is to break the "wick".

In order to effectively "break the wick", mulches must be coarse grained with large particle size – a fine mulch with the earthy consistency of say compost, will not break the wick, as the presence of fine particles allows water to rise through capillary rise.

Further, a fine-grained material, such as compost, will absorb and hold applied water, preventing it from draining down into the soil, thus inhibiting rainfall or irrigation from reaching the plant roots.

There is a common misconception – that mulches should be earthy and fine grained like compost.

In fact, the correct characteristic is quite the opposite – a good mulch should be chunky and porous and contain very low amounts of fines so that applied water can drain through to the soil and plant roots below, whilst also allowing oxygen exchange between the soil and the atmosphere.

Eclipse Soils Aquamor Mulch™ meets these optimum characteristics and on this basis has received Smart Approved WaterMark accreditation.

When applied as a 75mm to 100mm layer, Eclipse Soils Aquamor Mulch™ will reduce evaporation by about 70%.

Reduced soil temperature

Soil temperatures in warm/hot weather under organic mulches are much lower than under bare soil. Research has found that maximum daily soil temperature at 30cm depth can be reduced by between 8 degrees Celsius at midday and 13 degrees Celsius at 6 am.

This reduction in soil temperature benefits plants by reducing evaporation potential and reducing peak soil temperatures during very hot weather, which reduces heat stress to plant roots.

The reduction in soil temperature also provides improved conditions for the development of soil microflora and microfauna, which are essential components of the soil ecosystem for many types of plants.

Suppresses Plant Pathogens – in particular *Phytophthora cinnamomi*

Soil microorganisms play a crucial role in mitigating soil pathogens such as *Phytophthora* Dieback and Nematodes. They are the natural inhabitants of soil and have evolved complex interactions with each other and the environment to maintain a healthy soil ecosystem.

Beneficial microorganisms such as bacteria and fungi can outcompete harmful pathogens for resources, preventing them from establishing themselves and causing disease. They can also produce and secrete compounds that have antimicrobial properties, which can kill or inhibit the growth of soil pathogens.

In addition, microflora and microfauna can stimulate the plant's natural defence mechanisms. They can induce systemic resistance in plants, which makes them more resistant to pathogens. This is achieved through the production of signalling molecules that activate the plant's defence responses.

Phytophthora cinnamomi is continually mutating and has become a worldwide environmental issue now affecting an ever-increasing cohort of plants, including native species such as jarrah, banksia, tuarts, grasstrees, peppermint and grevilleas, and non-native species such as avocado, azaleas, camellias and shortleaf pines. There is only one chemical spray effective against *Phytophthora cinnamomi* so the use of mulch and robust water retentive soils is critical in inhibiting the spread of *Phytophthora*.

Fewer Weeds

Many seeds do not germinate under a mulch, or if they do the seedlings die before reaching the light. Those that do struggle through are weakened and are easy to remove.

This is not true for all products labelled as mulch:

- mulches which are **not** composted and pasteurised **may** contain seeds which will germinate in the body of the mulch layer, particularly if the mulch is fine grained and holds water applied by rainfall or irrigation; and
- mulches that are too fine can be excellent beds for germination of wind blown weed seeds, due to the presence of fine materials and the presence of retained water from rainfall or irrigation.

Eclipse Soils Aquamor Mulch™ is composted and pasteurised and **does not** contain a significant number of viable weed seeds.

Furthermore, due to its chunky nature and the absence of significant fines in Aquamor Mulch™, when applied in a 75mm to 100mm layer, it **does not** provide a suitable medium for the germination of windblown weeds.

Deeper root development

Course mulches allow water to drain freely through to the underlying soil, which enables water to penetrate deeper into the soil profile, helping to stimulate the growth of deeper root systems.

Fine mulches tend to soak up and hold water near the surface, reducing the volume of water that reaches the underlying soil and reducing the depth of penetration of water into the soil profile. This encourages root development near the surface or within the mulch layer itself where the water is held, rather than in the soil below.

These shallow root systems are more vulnerable to drought and have a much greater reliance on irrigation in the summer months.

The photo below shows an example of a poor quality fine grained mulch compared to high quality, course grained Aquamor Mulch™.



Poor quality mulch - consisting largely of fines, which will hold water instead of draining through to underlying plant roots, create a medium for windblown seed germination and encourage root growth near the surface, creating a higher dependence on irrigation in summer.



Aquamor Mulch™ - pasteurised and screened to be chunky, free draining, free from fines and to have a very long life.

Case example of poor mulch selection and application

The following is an example from a recent Perth development project which shows how wrong the choice of mulch and its application can be carried out.



Problems

The mulch is fine grained and would be better described as a composted soil medium than a mulch, so:

- applied water will be absorbed and held by the mulch layer and little or no water will reach the underlying soil;
- plant root growth will be greater near the surface and not at depth, resulting in greater irrigation demand and stress in hot weather;
- it does not appear to have been composted or pasteurised so it will likely contain viable weed seeds;
- the fine grained nature of the material and the water it will hold will make it a very good medium for the germination of windblown seeds; and
- the underlying soil has not been improved and retains the less than optimum characteristics of sand – negligible organics or fines and therefore little ability to hold water or plant nutrients.

Hardwood Mulches vs Pine Bark and Softwood Mulches

While both hardwood and pine mulches have their benefits, some of the benefits of hardwood mulch over pine mulch include:

- Longer lifespan: Hardwood mulch decomposes more slowly than pine mulch, meaning it lasts longer and requires less frequent replacement.
- Provides better weed suppression: When screened to remove fines, hardwood mulch provides better weed suppression than pine mulch due to its chunkier nature and slower decomposition rate.
- More attractive appearance: Hardwood mulch has a darker colour than pine mulch, which can make it more visually appealing.

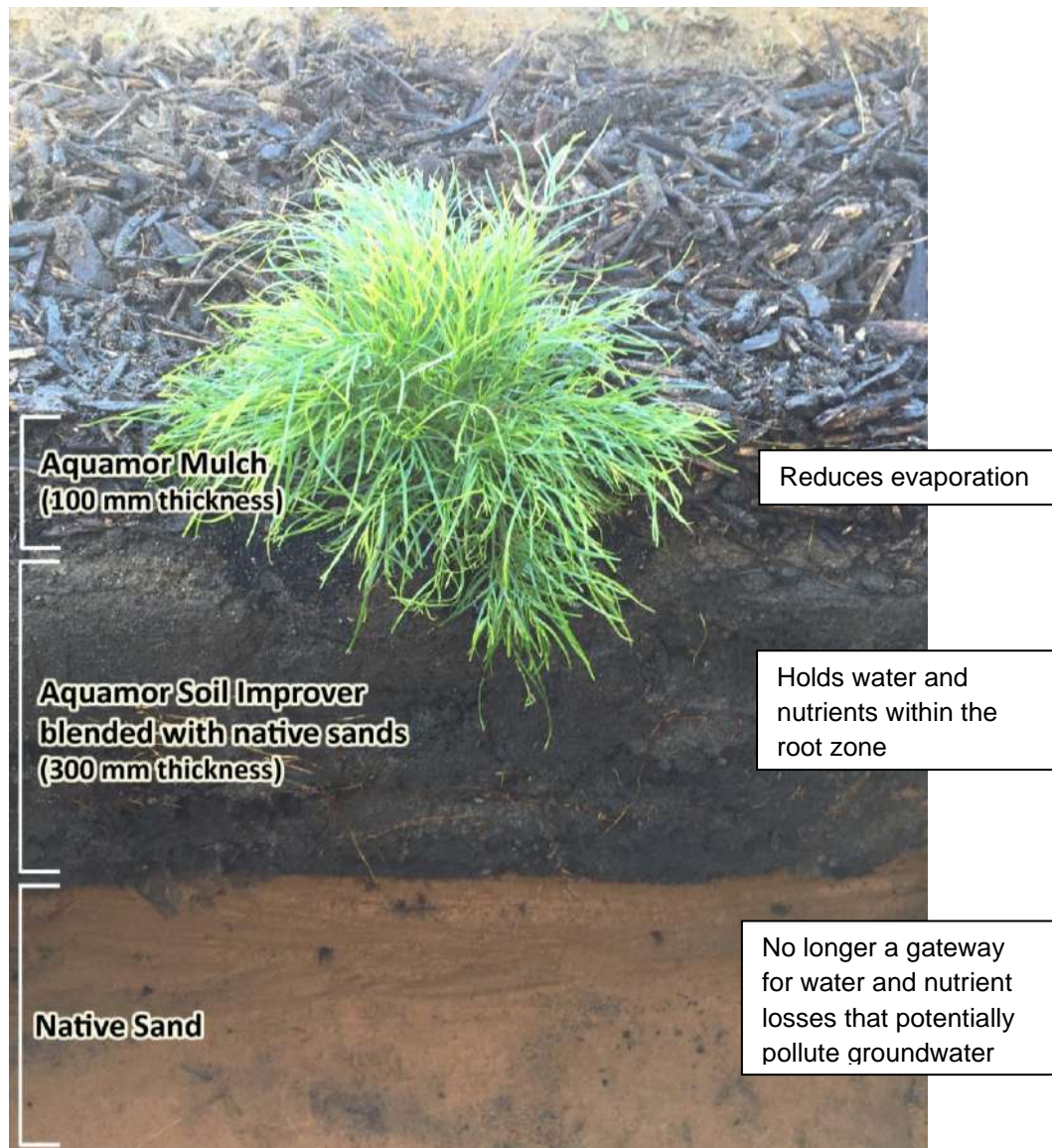
An example of the optimum use of Aquamor Mulch™

The photograph below depicts a high quality amended soil profile created by:

- adding Aquamor Soil Improver™ to the native sands to transform their texture to a sandy loam with added organics,
- applying a 100mm layer of Aquamor Mulch™, which is coarse grained, and composted and pasteurised to remove weed seeds, allow rapid drainage of applied water to the underlying soil and reduce soil temperature.

Plant growth will be stimulated and sustained by:

- the improvement of the native sands using Aquamor Soil Improver™, which adds clay fines and organic matter, thus improving plant available water by 5 times compared to sand; and
- applied water will drain through the mulch layer to the underlying amended soil (Aquamor Soil Improver™) and resultant healthier and more developed root systems. Soil temperatures will be reduced, further reducing evaporation loss and sustaining soil temperature for optimum root growth and function.



Weed growth from entrained viable seeds will be negligible to zero, and germination of windblown seeds will be minimised due to the absence of moisture in the mulch layer and the absence of fines.

Evaporative soil water losses will be reduced by up to 70% and oxygen exchange between the soil profile and the atmosphere will be enhanced.

Some facts about Aquamor Soil Improver™ products

Mulching is just one part of an optimum approach to reducing water loss and sustaining healthy landscapes.

The vast majority of the Perth Metropolitan area is built on sandy soils, which are very poor for agriculture, horticulture and landscaping, as they have poor water and nutrient and retention capabilities.

In contrast, sandy loam and loamy sand soils are the best textured soil for agriculture, horticulture and landscaping, as they hold significantly more water and have clays, silts and organics present, which have better nutrient and trace element retention capability and support a better micro fauna and flora population.

Eclipse Soil's Aquamor Soil Improver™ is a blended soil additive which contains significant quantities of clay, silt and organics, developed following extensive research and development which culminated in its Smart WaterMark approval. When blended with native sands at about a 1:1 ratio, Aquamor Soil Improver™ permanently transforms the soil texture into a sandy loam or loamy sand, depending on the specific nature of the native sands.

This increases water retention by a factor of around 5 times and retains applied nutrients against leaching, thus providing for better plant growth through increased water and nutrient availability.

Scientific demonstration trials have shown that Bassendean Sand amended by the addition of Aquamor Soil Improver™ on a 1:1 ratio have shown that irrigation demand to sustain healthy plant growth is reduced by about 50%.

Soil amendment in this way is an important and effective approach to managing irrigation demand and permanently reducing the requirement for irrigation to sustain healthy plant growth and landscaped areas.

More Information

For more information on how to select and apply mulches and soil conditioners, contact Eclipse Soils or visit our web site at www.eclipsesoils.com.au.

More information on Smart Approved WaterMark can be found at <http://www.smartwatermark.info/home/inner.asp?pageID=872>.

For further technical background refer to <http://ozbreed.com.au/articles/the-good-the-bad-and-the-ugly-of-mulch/> or Growing Media, Handrech.K and Black N, University of NSW Press.