Ready, Set, Grow

SCHOOLS PROGRAM

NSW GOVERNMENT Health
Northern Sydney
Local Health District

HORNSBY SHIRE COUNCIL

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Introduction to ecology and the ADAM principles

It's all about the soil

Great soil is the foundation of your garden. If you have great soil, you'll be able to grow a great garden! The answer to great soil is organic matter or living things, also known as humus. Humus is what is left when any plant or animal tissue decomposes so it's high in carbon and very dark.

Why is humus soil so great

Let's ask ADAM…

- Aliveness - Invites microorganisms and insects to inhabit the soil
- Diverstiy - Adds nutrients (both macro and micro elements)
- Aeration - Creates spaces for oxygen and water to enter
- Moisture - Helps to retain moisture

Aliveness

Great humus soil has living materials and organisms. By organisms, we mean animals like insects, worms and microorganisms as well as fungi. The animals break down the plant matter and release essential nutrients for plants to grow. Beneficial fungi hold soil particles together, act as root hairs and destroy soil pathogens that cause disease. All soil organisms improve the structure and drainage of the soil with tunnels and holes allowing water and oxygen through the soil. It has been estimated that the average earthworm population is 50,000 per 4000sq metres. The Fagan Park Eco Garden is approx 3250 sq metres!

Diversity

Diversity of plants and animals making up your humus is crucial. If soils lack a diversity of plant matter, it reduces the diversity of animals that will inhabit the soil. If soil lacks diversity in nutrients, it will affect the ability of plants to grow, yield flowers and fruit and resist pests and disease.

Aeration

Humus soil can contain up to 60 percent air and will fluctuate with the addition or subtraction of water. Air pockets and tunnels occur naturally through insect activity and as organic matter breaks down. Aeration in soil keeps the soil loose and soft for root penetration and oxygen availability for insect and microorganism activity. This activity then continues to allow the soil to be turned over and for further movement of nutrients and air.

Moisture

Water availability is critical to plant health. Plants can receive water naturally through rain and from the soil. We are unable to control the weather but we can build the soil with humus that helps to retain moisture that has fallen. One way you can tell if your soil has good humus is by how quickly the water dissipates. In humus soils, water will trickly slowly down, being captured in little holes and spaces rather than pooling (clay) or disappearing immediately (sandy).

How can you tell if you have humus soil

Soil type	Feels when damp	Action when picked up	Capacity
Humus	Crumbly	Breaks into chunks and crumbs of various sizes	Retains nutrients, water and microorganisms
Sandy	Gritty	Falls apart	Leeches water and nutrients
Clay	Sticky	Easy to mould	Difficult for roots to penetrate or extract water
Silt	Silky smooth	Falls apart	Reduce air and water movement

Improving the soil

Compost and worm farms

Compost is a fantastic way to introduce organic matter to your soil while reducing food waste that would otherwise go to landfill. Kitchen and garden scraps are full of the nutrients that soil animals love to eat and plants need to grow. Compost bays and bins can take more variety of food and garden items than worm farms. However, using a worm farm is a quick and effective way to produce a liquid fertiliser. A couple of times per year you will also get a compost like material (called castings) that can be added to your soil just like compost.

Green manure crops

This refers to growing particular plants that are highly nutritious and then cutting them down and turning them into the soil before they flower and seed (approx 4 to 8 weeks). These crops are very good at drawing up nutrients and water, that then are released back into the top layer of soil while also introducing organic matter. Growing these crops can often be a first step to improving depleted and degraded soil. Also known as cover crops, they can provide shade and activity for the soil when no other planting is occurring. Check which crops are more suited to winter and summer.

Some common green manure crops are:

- Barley
- Buckwheat
- Broadbeans
- Fenugreen
- Lupins
- Red clover
- Mustard
- Oats
- Peas and other legumes

Mulch

Mulching is soil's best friend on the outside! Adding a layer of lucerne or sugarcane mulch reduces temperature fluctuations and evaporation; it increases microorganisms and insect activity and as it breaks down introduces more organic matter into the soil. An addition of newspaper under the mulch can assist in the suppression of weeds. You can also create living mulch with green manure crops. In fact it's better to have something covering the soil than nothing. Herbs and grasses that you have yet to weed can be considered more friend than foe if you keep some clearance around any fruit or vegetable. The most beneficial time to mulch is in spring and autumn. In spring when it's warm but before the soil heats up too much and then additional mulch over summer as needed. Then at the start of autumn so by mid to later winter the mulch has broken down enough for sun to get through.

Commercial fertilisers

By commercial fertilisers, we mean liquefied, pelletised or powdered fertilisers that have been purchased. Fertilisers add nutrients to a soil to improve its condition. If we remember ADAM, great soil is more than just nutrients; soil still needs living materials and organisms, aeration and moisture retention. All of these can be created when we add organic matter. If we only add fertiliser, we lose out on those other important parts. Also some commercial fertilisers are heavily made up of NPK (Nitrogen, Phosphorus and Potassium), which are only three of the 15 elements that are important for balanced plant health. In addition, many commercial fertilisers are synthetic and made from petro chemicals, meaning they are oil dependent which is a finite resource and manufacturing of these contributes greenhouse gas emissions. However, natural fertilisers such as compost, worm farm castings, green manure crops and mulch are made up of living things and can be produced onsite.

Is pH important?

pH is a unit of measure and it controls two important factors;

- The availability of nutrients
- Level of activity of soil animals

Checking your pH before you create a garden is a good step to ensure you do not have an overly acidic or alkaline soil, as all the major nutrients are freely available to plants with a soil pH of 6.5 to 7.5. Adding more compost or old cow manure will improve the acidity. Adding wood ash or lime will increase alkalinity. However improving your soil by following the ADAM principles will generally bring the pH back to around neutral.

O	2 to 3	7	12	14
Acid	Lemon juice and vinegar	Neutral	Bleach	Alkaline

There are some plants that do prefer soil outside neutral. For example, acid soil loving plants obtain iron better with a pH of between 5 to 6 ie. potatoes, blueberries, strawberries and bananas. Alkaline soil loving plants grow well with a pH just over 7 ie garlic and lavender. You can obtain a pH kit from a gardening or hardware store. Ensure you test multiple sites over several times to get reliable results.

What about pest and disease?

Disease

Plants that have access to all their nutritional requirements air and water; have the ability to fight off potential disease and pests. It is when they are weak and struggling that they are vulnerable.

Rotating crops can break the cycle of pathogens and pests. For example, for the same garden bed, plant legumes and then follow with leafy greens and fruiting vegetables and then again by root crops.

Pests

Humus soil also attracts many beneficial soil living animals that can feed on pests. Beneficial soil living animals such as

- Both the ladybird larvae and adults love to devour aphids, mealy bugs and scale populations.
- Beetles eat most insects
- Praying mantis which will tackle anything up to half its size including grasshoppers
- Lacewings and their larvae called antlions which can eat more than ladybirds
- Dragonflies, some of which can live up to 30 years in its semi aquatic larvae form, feeding on mosquitoes
- Spiders help to control insects
- Centipedes are mostly nocturnal and eat snails and slugs
- Lizards and frogs

Pesticides do not distinguish between pests in your garden or their predators so applying pesticides removes all insects, which reduces the aliveness factor you need for healthy soil. In fact, it is often said that you can't have too many pests, just not enough predators.

Remember, great humus soil is the foundation to your garden.

If you apply the ADAM principles (Aliveness, Diversity, Aeration and Moisture) then you can build a productive, resilient and sustainable garden!