Soil

Here is what our regional council has to say:

_In many parts of our region, the quality of our water and soil is getting worse as a direct result of human activities. What we are doing on the land in the everyday course of earning a living is showing up as changes in the water and soil. If not addressed, the situation could worsen to the point where many of our streams and rivers can no longer be used for stock water, farm dairy use or swimming, and the soil will be unfit for some land uses. Ultimately, because our rivers flow to the sea, our coasts are also affected by what we do on the land._

Healthy Soil is recognised as being central to the health and wellbeing of people and planet. In this paper we will highlight some of the issues related to healthy soil and how you can contribute to

IN the Waikato there is an emerging issue of declining water and soil quality in rural areas of our region.

The amount of carbon in our soils has depleted

The microbiology of our soil has depleted

Regular cultivation exposes more soil to the air, which mineralises soil organic matter. This means that the soil's organic carbon is lost as the gas carbon dioxide (CO$_2$).

Professor Lex Chalmers has noted that some of the best soils in the Waikato are now captured by lifestyle blocks, where very little food is grown.

Compaction (the loss of spaces within the soil) and excessive fertility are the main soil quality issues in the intensively used areas of the Waikato region. Soil loss through erosion is also of concern, especially in hill country. The build-up of contaminants in soils has the potential to be a major issue in the future if current trends continue. Impacts of increasing stock density and continued subdivision of productive rural land are also important issues.

Soil structure controls the movement of air and water through the soil and the ability of roots to penetrate into the soil. It also provides a habitat for a number of beneficial organisms like earthworms, bacteria and fungi. Soil with good structure has a significant number of large pores that provide air to these organisms, good drainage and high water-holding capacity.

A high soil organic matter content increases aeration, water holding capacity and nutrient holding capacity. High organic matter in soils is associated with a healthy soil. Organic matter losses can be caused by repeated cultivation and compaction. Pugging and compaction can degrade the soil structure. Pugging is caused by animal treading in wet conditions. Compaction is caused by animal treading, vehicle movement and repeated cultivation.

There are also indications that soil compaction is a common issue under intensive land use and that some contaminants are building up in soils in parts of the region.

There are indications that soil structure may be deteriorating as a result of stock trampling and machinery use, although seasonal variation can influence the trends shown by monitoring. In the most recent survey only a quarter of our region’s dairy farming soils met national soil quality targets. There are clear links between declining water and soil quality and the intensification of land use in
the region. Significant efforts will be needed to reverse the downward trends identified, and to sustain profitable farming without compromising water and soil quality for present and future use.

In your home garden you can avoid compacting soil by creating standing zones.

Excessive use of fertiliser:

Soil samples from Waikato farms show that in some cases more phosphate fertiliser is being added than plants can absorb. On dairy farms, many soil samples (44 to 50 per cent) from volcanic and sedimentary soils show excessive phosphorus fertility. This increased markedly between 1996 and 2001 (see Figure 19). About 10 per cent of samples from sheep/beef farms have excess phosphorus fertility. Environment Waikato’s own soil quality monitoring shows that about one quarter of pastoral soils have excessive levels of phosphorus. Sampling of horticulture and cropping soils shows that about a third of samples have excessive phosphorus fertility.

Excessive soil fertility comes at a cost to farmers. • Close to $25 million worth of nitrogen is lost from soil on Waikato farms every year. This equates to $2912 per year for an average dairy farm and $3328 for a sheep and beef farm. While N loss per hectare is lower on sheep and beef farms, total loss is similar due to the much larger size of these farms. • Nearly $3 million worth of phosphorus is lost in run-off from Waikato farms every year. This equates to $160 for each dairy farm and $954 for a sheep and beef farm. • Nutrient budgets could save dairy farmers $6000 in fertiliser costs, on average, every year, without decreasing productivity. Some farmers have achieved much greater savings from nutrient budgeting, for example $15,000 or even as high as $100,000.

Soil loss

A recent survey using aerial photography indicated that region wide, bare soil is around 1.4 per cent of total land area, of which: soil freshly disturbed by land use is around 1 per cent of the region’s area – mostly either topsoil exposure by livestock grazing in pasture, or disturbance by farm and forest tracks- soil freshly disturbed by natural processes is around 0.4 per cent of the region’s area. When soil is lost from productive areas, it takes valuable nutrients with it.

Subdivision

For the ten years between 1991 and 2001 3,196 hectares of rural land was subdivided into properties less than four hectares. For the five year period between 2001 and 2006 3,936 hectares were subdivided. In the following five years, 2001 to 2006, 3,936 hectares were subdivided. Thirty to 40 per cent of subdivision occurred on land with the highest productive capabilities (LUC Classes I and II). Overall, three-quarters of the land affected by subdivision had a ‘high productive capability for pastoral use’ (LUC Classes I to IV). Properties less than four hectares are overall likely to have decreased production compared with presubdivision production levels. This subdivided land has effectively been removed from large scale agricultural production, forcing this use onto land with a lesser productive capability. Some properties below four hectares may be used for intensive agricultural and horticultural uses that generally require much more fertiliser, water and energy than large-scale agricultural enterprises. Rural subdivision is predominantly occurring in peri-urban areas. This could be an issue for the future if the most versatile land, suited to a wide range of crops, is subdivided to the extent that intensive food production can only occur on less suitable soils. This
would have greater environmental impacts and would limit the range of crops that could otherwise have been grown

Why organic matter is important

Long term protection and improvement of soil organic matter is needed to maintain:
- soil structure
- microbial activity in the soil
- soil buffering (the ability of a soil to stay at the same acidity)
- nutrient storage
- water retention.

Soils with low organic matter have low microbial activity. The soil microbes break down harmful chemicals such as pesticides. When soils have low microbial activity and low water holding ability they are more likely to leach pesticides. This means that cropping soils leak pesticides more readily than other soils.

Soils that have lost a lot of their organic matter need more and more fertiliser and water to maintain productivity. To find out more about preventing fertiliser runoff read the NZ Fertiliser Manufacturer’s Research Association Code of Practice for Fertiliser Use.

Increasing soil organic matter

Reducing cultivation and soil disturbance minimises the loss of organic carbon. By implementing reduced tillage or no-tillage, where possible, soil structure and soil organic matter will be preserved. Erosion risks will be reduced as well.

Check out the NZ Fertiliser Manufacturers’ Research Association Code of Practice for Fertiliser Use.

To increase the organic matter in the soil you can:
- grow annual cover crops between productive crops – these cover crops can then be mulched into the ground
- apply compost, organic manure or effluent to the soil.

With more organic matter, soil is better able to store nutrients and water, and has improved soil structure. This makes soil more resistant to erosion by wind and water.

What you can do:
- Compost
- Create a worm farm
- Mulch
- Reduce your use herbicides and pesticides and if possible don’t use them at all.