MARLBOROUGH DISTRICT COUNCIL

Soil Quality - Monitoring Summary 2018

Key Points

- In general soil quality is acceptable but three main trends are evident. Increased risk of loss of nutrients to water, increased soil compaction and loss of soil organic matter.
- The results for the 2018 round are consistent with previous monitoring rounds.
- A new statistical analysis process has determined the soil quality monitoring programme does produce robust statistically valid results.

Why do we monitor soil quality?

- Soils are the protective skin of our planet – they store water and nutrients, support plant growth, mitigate greenhouse gas emissions, filter and breakdown pollutants. They also act as a buffer between human landuse activities and aquatic environments.
- Soils are at the heart of our economy, underpinning our agriculture, viticulture, forestry and other primary industries.
- However, soils are fragile and if they are not carefully managed they are at risk of degradation. This degradation may happen through erosion, leaching of nutrients, compaction or loss of organic matter.
- Degraded soils lose their productive capacity and become ineffective at filtering contaminants. Lost organic matter contributes to greenhouse gas emissions. Nutrients and sediment lost to leaching and erosion contributes to downstream water quality issues.
- Soils take thousands of years to form so degradation can be difficult to reverse.
- It is therefore vital we have detailed information on what effect we are having on our soils.
- Council is required under the RMA to report on the “life supporting capacity of soil” and to determine whether current practices will meet the “foreseeable needs of future generations”.

The soil quality monitoring programme

The Soil Quality Monitoring programme consists of a set of 92 sites and subsites (158 in total) located on representative soils and landuses around the Marlborough region. Each year, replicated samples of soil from a subset of these sites (approx. 25 sites / year) are sent for laboratory analysis. Each site is visited on a 5 yearly rotation. The annual samples are analysed for a series of chemical, physical and biological properties. These properties are used nationally and are known to be robust indicators of soil quality. The results are assessed against a set of target ranges.

Previous results have been published in a detailed Soil Quality monitoring report, however in 2018, a simplified summary is presented. The results presented here are consistent with the results found in 2017 and the reader is referred to the 2017 Soil Quality Monitoring report for in-depth explanation of the programme and the results.

2018 monitoring round

The 2018 monitoring round visited 24 sites. 50 chemical and biological samples were taken and 150 physical samples. The sites sampled this year consisted of 4 cropping sites, 1 exotic forest site, 6 pasture sites and 13 vineyards. Sample analysis was performed at Hills Laboratories for chemical and biological properties with Manaaki Whenua Landcare Research performing the physical analysis.

2018 Results

The results from the 2018 sampling round are consistent with earlier rounds. The common themes identified in the 2017 report continue to be evident. Figure 1 shows the percentage of samples not meeting their target for a specific soil quality indicator. All samples for pH and trace elements met their target ranges. Olsen P, and air filled porosity showed a large number of samples failing to meet the target ranges (27, 24 samples respectively). AMN, total carbon and nitrogen, C:N Ratio and bulk density had smaller numbers not meeting their soil quality target.

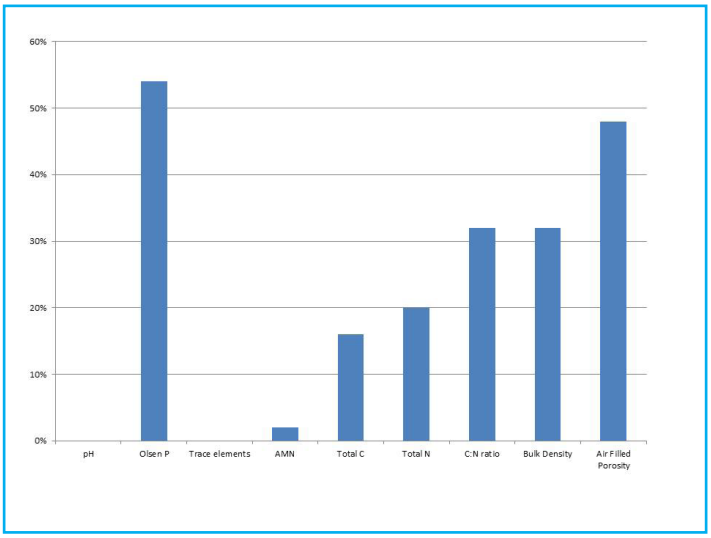

Figure 1: Percentage of sample not meeting target ranges.

Long-term trends

As seen in previous soil quality monitoring reports, 3 key trends have continued in 2018. The risk of nutrient loss continues to be evidenced by elevated total nitrogen, anaerobically mineralisable nitrogen and Olsen P. Soil compaction is shown by low air-filled porosity and high bulk density. Loss in soil organic matter is also evident and some additional samples were taken as a case study in vineyard soil management. Figure 2 shows the decline in total carbon for 2 vineyard sites. Site 27 is a well-established vineyard and site 28 is a more recent conversion. Figure 2 shows a clear decline in total carbon for both sites at the time of establishment (2013 for site 27, 2015 for site 28). Total carbon varies for the three vineyard subsites (vine, wheel and inter-row) but remains below the historic values except where pasture grass inputs have occurred long-term (Site 27 inter-row). This represents a significant effect in terms of soil quality.

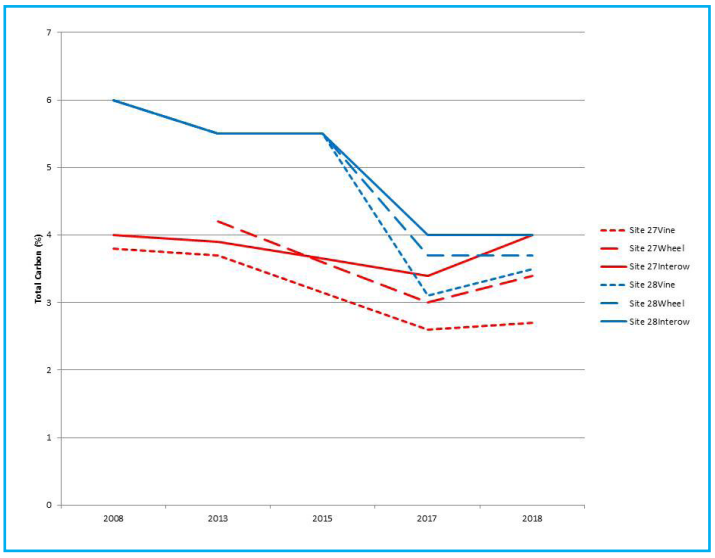

Figure 2: Changes in total carbon for two vineyard sites.

Statistical analysis

In order to ensure the soil quality monitoring programme was meeting its objectives to report on long-term trends in soil quality, a new statistical analysis has been developed. This method allows us to determine what level of uncertainty exists around the long-term trend data. The method involves the use of spline regression where all of the previous data, Figure 3, illustrates an example of the new statistical output showing the trend over time for all Olsen P (phosphate) samples. This graph indicates that the average annual Olsen P value will fall within the 95% up and down lines providing certainty that the sampling regime is rigorous enough to give statistical valid results.

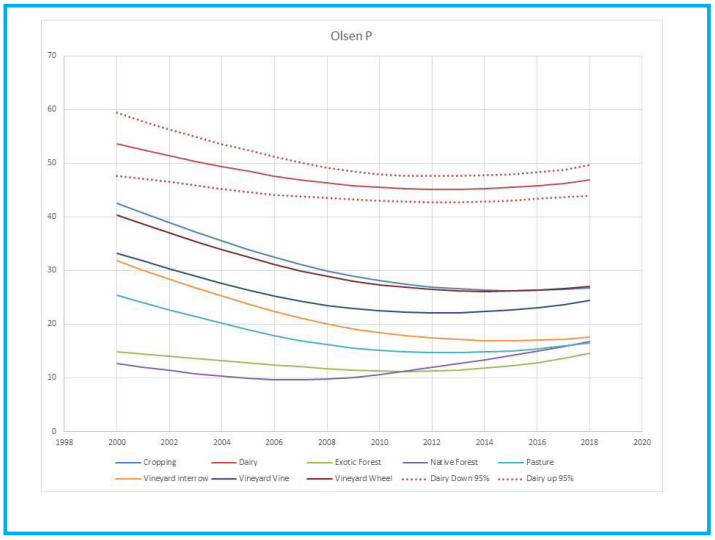

Figure 3: Illustrates the differences between Olsen P values for differing landuses. The dairy trend line is shown with the same 95% confidence intervals determined by the new statistical analysis.

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For more information on soil quality go to

www.marlborough.govt.nz

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