



# Global Urban Forest

Soil Health • Tree Health

## **Veale Gardens Remediation Project – Advanced Environmental Sensing and Best Practice Plant and Soil Health Care**

*An endeavor to produce a holistic, functional, financial value for urban trees based on science.*

By Matthew Robin Daniel

May 2018



In 2015 ‘City of Adelaide’ in South Australia commissioned a world first extensive study into the rapid tree decline in Veale Gardens.

The project lead by Matthew Daniel of ‘Global Urban Forest Pty Ltd’ was designed to measure factors and variables under a holistic approach including soil and photosynthetic science and was reported extensively on an annual basis.

Over the past three years of analysis at Veale Gardens, photosynthetic function, soil testing as well as physical site soil analysis, has been combined with Plant Health Care (PHC) remediation applications, on 30 trees within the park. This project was engaged to arrest the decline of significant trees and potential inadvisable change to one of Adelaide’s most premier and historic open space parks.



Above – 30 trees of a variety of species, chosen to conduct the Veale Gardens PHC Program.

To understand tree health holistically, soil parameters are essential to include. The Veale Gardens PHC Project has obtained a valuable and world first set of baseline soil and photosynthetic analytics, that can be used for current Urban Forest management and will provide future managers crucial information in changing environmental conditions due to climate change.

In October 2018 another round of soil testing is scheduled and will be conducted to combine with the growing set of data identifying the progress of soil remediation works. The soil analyzed by independent laboratories consists of two major categories:

Soil Chemistry

Soil Microbiology

Soil science is entering a new realm of understanding in how soil functions, the complexities that are being unearthed identify crucial ecosystems beneath our feet that support the entire natural world.

Soil science and management can be broken down into three essential components and described as the ***sustainable NPK***.

**N** – Nutrient

**P** – Physical Structure

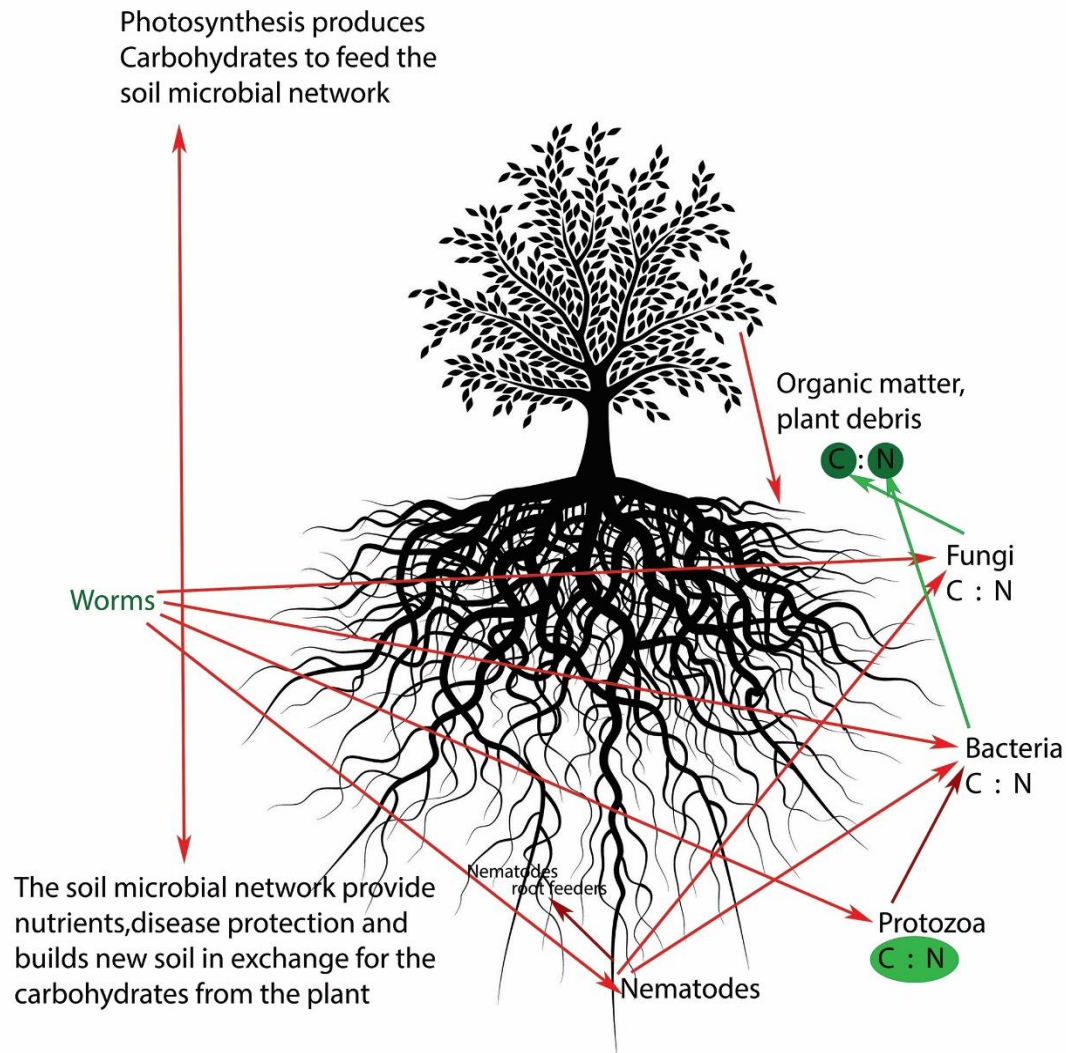
**K** – Key Biology





The Veale Gardens PHC Project data identified major problems with the health of the soil within the park. Under the ***Sustainable NPK*** concept the system was undeniably broken and this led to the decline in tree health within the park. *Healthy trees grow from healthy soil.*

As the concept states the key was in the soil biology, (microbiology) The living component of soil.



With a rapid introduction of soil biology as part of the PHC Program applications, physical structure dramatically improved (soil compaction decreased) and nutrient balanced in the soil. This led to improved tree health, vigor and function. The tree decline was arrested within the first year of treatments.

Between 2016 – 2018 two PHC programs have been conducted including the application of industry compost AS 4454 – 2012 compliant, but microbial poor material, mulch and liquid applications of Actively Aerated Compost Tea (AACT) plus microbial stimulants were also applied to stimulate the beneficial soil biology.



The AACT facility set up at the Adelaide City Nursery to produce some of the PHC liquid applications. Actively Aerated Compost Tea (AACT) is a microbial concentrate or inoculum of living beneficial soil life produced from high quality microbial compost. It is the most effective way to remediate soil health.





The G.U.F - UNIT 2 stationed in Adelaide for the growing season PHC applications.

The applications of liquid microbial concentrates have inoculated the soil and rapidly remediated the soil health over the 2017 and 2018 growing seasons. The increased soil microbial activity (Soil Food Web) has been measured annually via independent laboratory analysis and visually observed through the activity of mycelium and fruiting bodies (mushrooms) with an impressive diversity of fungal species. The development of fungi has also occurred during the summer months in temperatures between 35° – 40° C. This microbial activity is developing a new and improved soil for new establishing root growth which has increased each trees Root: Shoot ratio.





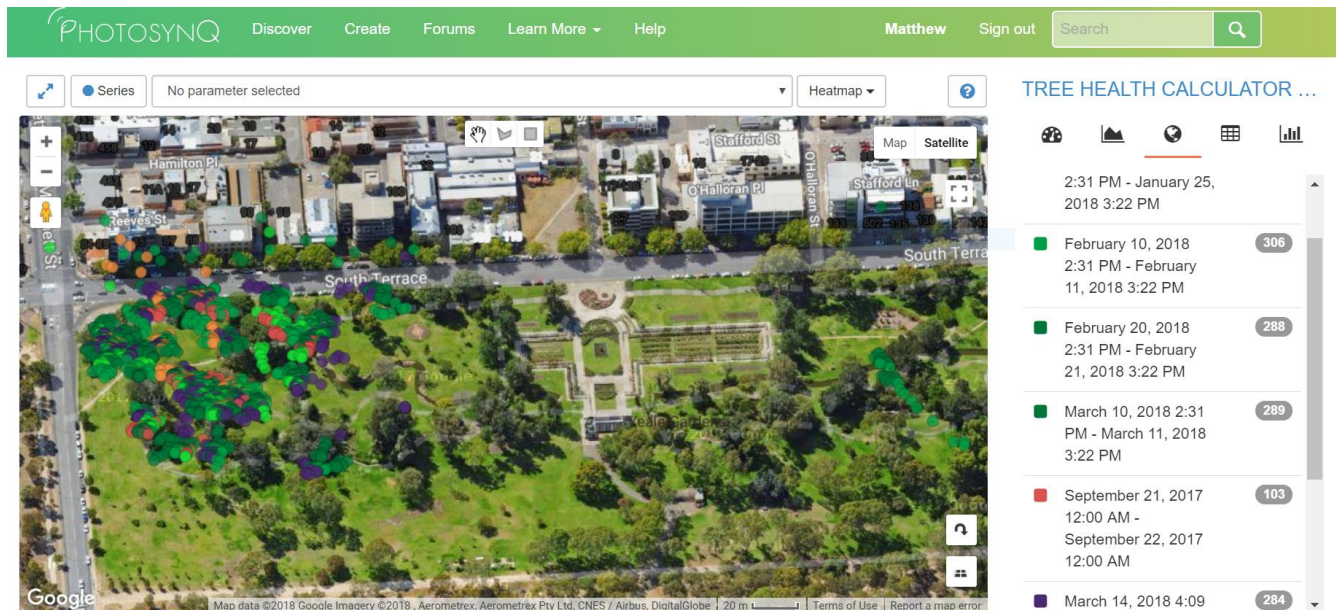
**Fruiting Body (Mushroom) diversity of species growing in response to the soil remediation works**



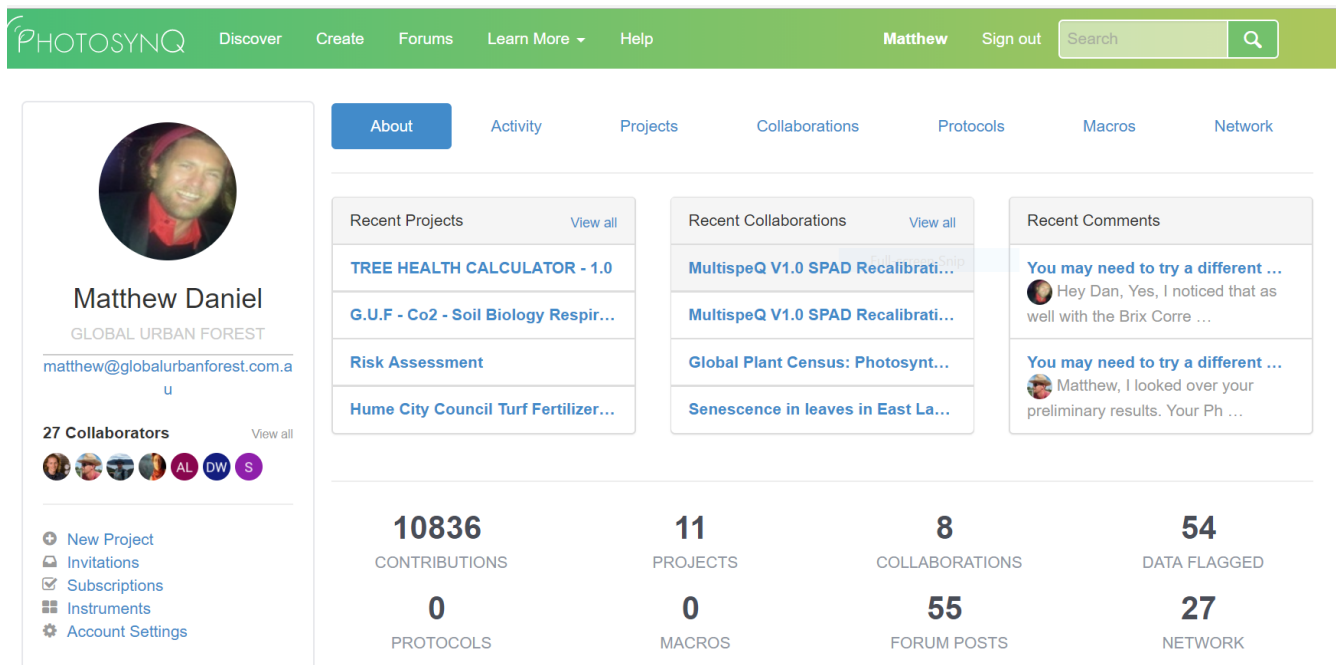




Determining improved tree health and function was obtained through visual observation, documented photographic evidence and advanced photosynthetic measures. The Photosynthetic measures were obtained with a multi - spectrometer and the [PhotosynQ](#) platform.



PhotosynQ developed out of Kramer Labs at Michigan State University is a unique open source platform that is revolutionizing environmental science. Over the past 3 years of the Veale Gardens PHC project PhotosynQ data has been collected as part of a Beta Testing program for MSU and provide City of Adelaide further evidence that concludes - soil health drives tree health.



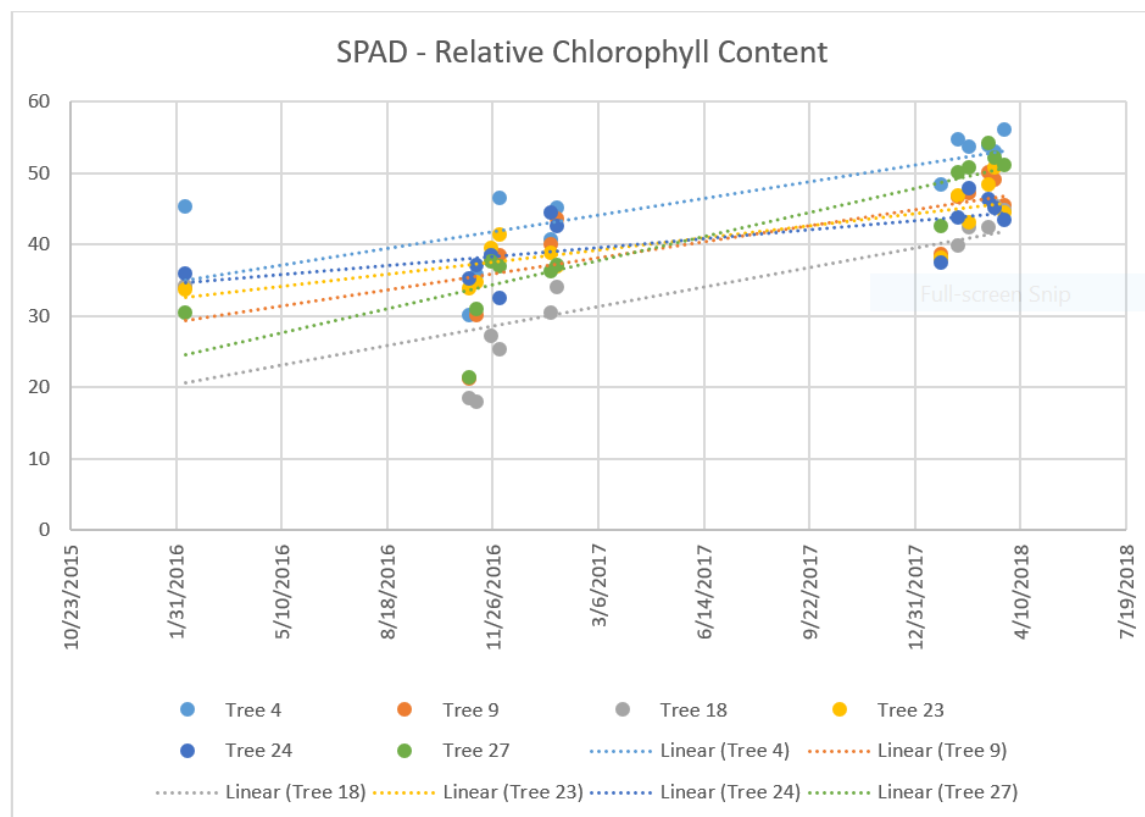
Above – The PhotosynQ open source platform (dashboard) that allow's for global collaboration in environmental science.



Currently the global urban forest industry relies on Arboricultural visual observation to determine tree health. Little if any scientific measures are obtained and documented in relation to specific tree health. This means the Visual Tree Assessment (VTA) is largely subjective, relying on human interpretation. This system is inherently flawed and does not establish baseline data and pass robust scientific information forward to future generations of urban forest managers. Urban Forest managers work reactively regarding tree health, largely based on a system of human perceived risk. To grow a successful and functional urban forest we need to work proactively and determine holistic tree health based on robust scientific measures. The future of advanced scientific sensors and open source platforms that compile decades of individual tree health and function measures will be the tools in the Urban Forester's toolbox.

Some may say this is inequitable but consider the functional value healthy trees provide in ecosystem services. Free air-conditioning, air quality filtration, storm water mitigation, habitat and livability. These are all essential for a healthy city environment. These services, that only healthy trees provide must be acknowledged and valued more than the current aesthetic value. The Urban Forest is just as essential as/or potentially higher than the built infrastructure we so easily attribute a financial value to.

SPAD over time:



The above graph identifies the increased trend in chlorophyll production of 6 trees monitored over the past 3 years. Not all 30 trees at Veale Gardens were measured initially in 2015. Further data is scheduled in late 2018 to identify a linear trend in the projects entirety.





Urban Forestry is arguably the most important industry in the world. As cities around the globe grow and develop into megacities, Urban Forestry will become an essential component and will need to be increased at a marked scale in relation to the size of the built environment.

Urban Forestry will at some stage be required to provide further and ongoing science to help establish and maintain trees in built environments.

More importantly Urban Forestry will be required to provide scientific evidence in relation to the substantial investment, protection and maintenance of the “Green” as the economics of growing a forest within a city will be substantial.

The City of Adelaide has demonstrated the importance of holistic tree management and invested in advanced environmental science that presently leads the field. The Veale Gardens PHC program demonstrates that, *an endeavor to produce a holistic functional financial value for urban trees based on science* is achievable.

