



Sydney Environmental & Soil Laboratory

Specialists in Soil Chemistry, Agronomy
and Contamination Assessments

Remediated and Constructed Soils of Sydney Olympic Park

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Reconstructing An Urban Soil/Vegetation Association

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“Lately I have been thinking that the point must be reached when scientists, politicians, artists, philosophers, men of religion, and all those who work in the fields should gather here, gaze out over these fields, and talk things over together. I think this is the kind of thing that must happen if people are to see beyond their specialities. An object seen in isolation from the whole is not a real thing.”
Masanobu Fukuoka 1978.

Abstract

Are scientists artless, and artists unscientific? The Millennium Park concept design team gave artists, technicians and scientists a chance to work together to resolve some fundamental problems of soil limitations and design. It was clearly put to the team that the severe soil limitations on site would not allow them to impose a vegetated landscape which was chosen purely for aesthetic reasons.

By understanding the natural distribution of vegetation and soil on the site it was resolved to follow the natural principles that lead to this inevitable distribution. What emerged in concept form resolved the disparate nature of the disturbed soil areas but tied in the natural soil/vegetation areas into a framework known as Millennium Parklands which is to be defined by “walls and rooms”.

This elegant concept allows us to have “rooms” of different soils depending on what furnishing is required (shallower soil for turf, deeper for forest) but also allows the natural catenary relationship which occurs from the top to the bottom of a hill, to occur within a room. Thus the grassland hill “room” can be surrounded by forest “walls” just the way nature would have dictated.

The result will be a low maintenance landscape built of recycled resources and prioritising those scarce resources where they are most needed. By explaining to the artists the limitations of the site soil resources the scientists may have helped to obtain a more interesting result than if soil resources were unlimited.

The Natural Soil Environment

My contention was simple. We should look to nature for our soil/landform designs and mimic its magnificent equilibrium for as form follows function Nature will provide the clues to avoiding the failures that some of the initial soil preparation works represented.

The Soil/Vegetation associations of the Homebush area are said to form part of the Blacktown Soil series based on heavy clay soils of the Wianamatta shales. Surface soil fertility is naturally poor and subsoils are sodic heavy clay of low permeability (poor drainage).

Our previous GIS survey of the Newington Olympic Village site showed that this was not the complete picture and that an old bench or plateaux of laminite sandstone still retained its Scribbly gum woodland forest in the RANAD property. These are sandstone profiles of intense gravel content. This gravel is a product of regular waterlogging of the soil A horizon.

Natural soil forms only a small but very important part of the Millennium Parklands. Despite massive human disturbance all the vegetation associations shown in Table 1 still exist although the only remaining dryland xerophytic heath remnant has been destroyed by the Olympic stadium.

From a Soil Scientist's viewpoint the following aspects of these associations are very clear-

- Water and hence topographic position define the vegetation type.
- As one proceeds up a hill the status of the vegetation declines as does the soil depth.
- Where there is no slope the soil will be hydromorphic even at the top of a hill.
- Poor drainage is natural to the environment of the Blacktown soils.

This understanding of the natural environment of the area will no doubt be interesting historically and an important tool in managing the remnant environments which are represented largely by the area within the old RANAD site. It also provides the key to designing the vast areas of new reconstructed soils that must be built on the majority of the area, disturbed waste reburials and fill.

Table 1. Natural Vegetation/Soil Associations of the Homebush Area.

| Vegetation Type | Soil Type |
|---|---|
| 1. Tall open Ironbark/Turpentine woodland | Red and Yellow podsolics on shale |
| 2. Tall scribbly gum/grey gum forest | Lateritic yellow podsolics on sandstone |

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| | weathering remnants |
| 3. Hydromorphic /Casuarina tall form | Low lying grey and hydromorphic podsolics on shale, some of the deeper but poorly drained low lying reconstructed soils. |
| 4. Hydromorphic Melaleuca Ti tree heath, short form some of the shorter Casuarinas | A heath of <i>M. stypheliodes/nodosa</i> occurred on dryland but poorly drained plateaux and slopes. |
| 5. Dryland xerophytic heath | <i>Kunzea</i> , shrubby <i>Melaleuca</i> and <i>Leptospermum</i> , <i>Dodonea</i> and <i>Bursaria</i> |
| 6. Riparian Melaleuca/Casuarina | Gleyed Humisols and solonchaks on the edges of water bodies, creeks and swamps both fresh and salt water. |
| 6. Riparian rainforest remnants like <i>Glochidion</i> , <i>F. rubiginosa</i> , <i>Eleocharis</i> , <i>Callitris</i> (Port Jackson cyprus). | Low lying spots just uphill from the riparian zone on deep yellow podsolics and colluviums. Sometimes only a few metres wide before giving way to ironbark woodland |
| 7. Salt Marsh | Minimal solonchaks and gley clay |
| 8. Mangroves | Unconsolidated gleyed clay and ooze |
| 9. Freshwater swamps | undifferentiated sediment, fill or alluvium substrate virtually unimportant. |
| 10. Sedges and hydromorphic vegetation | Humose hydrosols in valleys and elevated hanging swamps. |
| 11. Grassland/meadow | Wide variety of substrate both natural and reconstructed |

Compiled From: Benson and Howell. (1990)

Reconstructed Landscapes

The majority of the areas visible from the RAS and Olympic Boulevard are composed of reconstructed landscapes. These include the artificial hills of the waste reburials, Kronos and North Newington Hills, and the viewing mounds, as well the artificial fluvial landscape of the reconstructed Haslam's creek.

The concept of Walls and Rooms allows all these areas, as well as the natural areas, to function differently, with regard to plantscape, landform and soil, and human and ecological function, while unifying the differences just as happens in a natural environment often to pleasing effect.

The problems to be faced in constructing the new "facsimile" soils as they have become known, are related to-

- poor permeability of subgrades (a jumble of clay fill).

- considerable shortfall of topsoil resources (some was obtained from the Olympic Village).
- expense, environmental unsustainability, and general unsuitability of commercially available soil.

The poor permeability of subgrade presents no greater problem than occurred with the natural geology of the area and hence the same factors dictating vegetation type could be expected to operate.

The shortfall in topsoil resources meant that what precious natural topsoil was available was prioritised in the following manner-

- wetland or hydromorphic soils received no topsoil, just some fertiliser and amendments.
- Natural topsoil was reserved in greatest amount for the bottom of footslopes at depths up to 500mm to support tall forest and riparian vegetation types. It was also considered desirable to use some of the better grades of B grade fill as an artificial B horizon on top of the compacted landfill clay.
- Further up hills a shallower layer of topsoil is recommended sufficient to support woodland.
- On the crests of hills and sideslopes the use of grasslands/meadows would allow for the use of no topsoil at all but a completely reconstructed topsoil made from crushed sandstone and compost.

Using this system the design group developed a concept that solves many problems. Scarce resources are conserved for the higher status vegetation. The natural catenary relationship of the land is reconstructed in accordance with the “walls and rooms” concept. The most heavily trafficked areas, the grassland “rooms”, are composed of sandy soils capable of handling the expected compaction of millions of visitors while the natural soils, not able to withstand compaction, are used in areas where traffic volumes are much lower (the “walls”).

In this manner the scientists and the artists worked in complete harmony, responding to each others particular outlook and working, with some ups and downs, gradually but surely in the same direction. The most remarkable fact is that while looking at the conceptual landscape through our own individual knowledge filter, we all came to the same conclusion. We proved to each other that artists are quite scientific in their analysis, and that scientists are quite handy with a paintbrush.

References

- Benson, D.H. and J. Howell. (1990) Taken for granted: the bushland of Sydney and its suburbs. The Royal Botanic Gardens Sydney.
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