Blue Mountains' Stygofauna Monitoring Project Report 2011.

Title:

The condition of upland swamps in the Blue Mountains, NSW, Australia: Stygofauna abundance and richness linked to the percentage of catchment impervious surface cover

Authors: Nicole Ashby, Nicole Collas, Andrew McCormack and Natalie O'Donnell

Internal Supervisor: Grant Hose [Macquarie University]

External Supervisor: Michael Henson Blue Mountains City Council

Extracts from the Report:

'…**Executive Summary** [complete]:

Upland swamps provide important ecological functions, including flood mitigation, runoff filtration and habitat for numerous species of flora and surface- and subsurface-dwelling fauna. The swamps of the Blue Mountains are considered both threatened and vulnerable in a national and state capacity, respectively. The fractured sandstone aquifers lying beneath these Temperate Highland Peat Swamps provide base flow to the swamps. Whilst it is clear that the interchange between groundwater and swamps influences ecological functioning, to date there has been little effort to use swamp fauna as a measure of swamp condition. The aim of this study is to examine the subterranean invertebrate fauna (stygofauna) of swamps, and subsequently, determine the utility of stygofauna as a means of assessing swamp condition.

Within the Blue Mountains region, 12 bores were sampled, spread across 10 sites, in order to establish greater understanding of the richness and abundance of stygofauna communities. Site selection was dependent upon previous sampling efforts and access. Each bore was sampled using a bailer, with animals extracted from samples using a dissecting microscope, and classified according to taxonomic group. Additionally, stygofauna were used as a measure of swamp condition through linking with percentages of impervious surfaces at a catchment scale.

In order to assess the percentage of impervious surfaces within individual swamp catchments, a map was produced for each swamp, delineating the catchment area and the land use types. Through the use of Google Earth Pro, each land use area was determined. Subsequently, a previously reported scheme for determining percentages of impervious area was adapted to the predominant land use patterns of the Blue Mountains region. This allowed the percentage of impervious area to be calculated for each swamp. In addition to gaining a deeper understanding of influences on stygofauna and their distribution and abundance across the Blue Mountains region, this study

sought to provide supplementary information to be used in management of upland swamps by the Blue Mountains City Council.

The results of the study indicate that stygofauna communities are diverse and heterogeneous over varying spatial scales. No taxon was found to be present in each of the 12 samples. The dominant taxa were nematodes, accounting for 47% of all stygofauna. Crustaceans, including syncarids, ostracods and copepods, accounted for 40% of all animals collected. Bore 6 contained the greatest richness, with 8 of the 9 stygofauna taxa identified. Variation with regards to abundance and richness was significant, even over small spatial scales, <100 m. This was particularly evident in a comparison of bores 4 and 5, both contained within Marmion Swamp, site 4. The former contained 11 stygofauna in total from 3 taxa, compared with 623 from 4 taxa at bore 5.

The percentage of impervious surfaces within individual swamp catchments varied from 2.0% at site 6 to 36.5% at site 2. Total catchment area varied significantly for each swamp, from 483,271 m^2 to 8,440,000 m^2, with grass/forestry the dominant land use, followed by low/medium density housing and paved roads. No correlation was found between stygofauna abundance and percentage of catchment impervious surface cover or stygofauna richness and percentage of catchment impervious surface cover, through the use of univariate regression analysis. Similarly, community structure was not strongly linked with percentage of catchment impervious surface cover. Whilst these results were surprising in light of previous connections between invertebrates and impervious surfaces, it does not discount stygofauna as important indicators of swamp condition. Rather, there

is a need for further assessment of stygofauna community composition with regards to other environmental variables, such as nutrients.

This study provides important insights for the management of Blue Mountains swamps. Recommendations include the need to focus rehabilitation efforts on swamps with high abundance and richness of stygofauna, coupled with continuous monitoring of all sites with regards to stygofauna populations, pH, dissolved oxygen, temperature and nutrient levels. Specific attention should be paid to site 1, Former Lawson Golf Course, and site 7, Popes Glen Swamp, due to the high abundance of stygofauna recorded. Finally, due to the lack of a significant correlation between stygofauna communities and impervious surfaces, further efforts are required to link swamp condition with groundwater community assemblages'.

'…**Results [Lawson Swamp]**

Site location descriptions [Lawson Swamp]:

Site 1 - Lawson Golf Course Swamp: Site one is located adjacent to the Lawson Golf Course situated on Crown reserve land in Lawson (see Figure 4). One bore was sampled at this location, bore 1. At an elevation of 678 m, this valley fill swamp is approximately 4384 m², and consists mostly of a sandy sediment layer of approximately 130 cm, with a lower peat layer of around 20 cm in depth. Ground water depth was not recorded, as water depth was, at the time of sampling, above ground level. This swamp is part of the swamp care regeneration program and has had extensive rehabilitation works conducted within, and around the swamp, including revegetated buffer strips. The area is near the Great Western Highway, where major road upgrades are in progress. The swamp has a nearby storm-water detention basin, with much of the water pumping through this basin originating from the RTA upgrades of the Great Western Highway. Following a period of retention, this water then flows into the swamp.

Vegetation at the site was a mixture of native and introduced species. Native species had generally been reintroduced to the area through revegetation initiatives, and included: *Lambertia formosa, Leptospermum morrisonii, Pittosporum undulatum*, *Polycias sambucifolia* and *Pteridium esculentum* (see Appendix 6). Despite rehabilitation efforts, exotic vegetation within the swamp comprised around 50%, and included: *Cyperus sp., Juncus sp., Lonicera japonica*, *Pennisetum clandestinum*, *Ranunculus repens* and *Watsonia meriana'.*

'…**Appendix 1: Stygofauna counts according to site and species** [Lawson Swamp]

Bore number	1 [Lawson Swamp] 2 3 4 etc…
Site number	1 [Lawson Swamp] 2 3 4 etc…
Ostracods	469
Syncarids	53
Mites	36
Oligochaetes	373
Cyclopiod copepods	134
Harpacticoid copepods	14
Nematodes	646
Total number of Stygofauna	1725

Total number of species 7….’

…Site I Bore I Lawson Swamp adjacent Former Lawson Golf Course

Catchment Map: South Lawson Park and Former Golf Course:

...End Extracts.
