

## Appendix 12-A Results of Boggomoss Snail Survey



**NATHAN DAM, TAROOM**

# **RESULTS OF BOGGOMOSS SNAIL SURVEY**

**Report prepared  
for  
Sunwater**



***Biodiversity  
Assessment***

**AND MANAGEMENT PTY LTD**

**FAUNA AND HABITAT SPECIALISTS**

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Project Author/s: Dr John Stanisic

Project Summary: Reporting results of a survey for the Boggomoss Snail *Adclarkia dawsonensis* as part of an investigation into opportunities for translocation of the Boggomoss Snail population from Mt Rose Station at Taroom to another suitable location for the Nathan Dam Project.

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### Purpose of Report

Biodiversity Assessment and Management Pty Ltd has produced this report in its capacity as {consultants} for and on the request of SunWater (the "**Client**") for the sole purpose of reporting the results of a survey of the Boggomoss Snail *Adclarkia dawsonensis* for the Nathan Dam Project (the "**Specified Purpose**"). This information and any recommendations in this report are particular to the Specified Purpose and are based on facts, matters and circumstances particular to the subject matter of the report and the Specified Purpose at the time of production. This report is not to be used, nor is it suitable, for any purpose other than the Specified Purpose. Biodiversity Assessment and Management Pty Ltd disclaims all liability for any loss and/or damage whatsoever arising either directly or indirectly as a result of any application, use or reliance upon the report for any purpose other than the Specified Purpose.

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Date: 27/04/2009

Biodiversity Assessment and Management Pty Ltd

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Managing Director

# EXECUTIVE SUMMARY

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The Boggomoss Snail *Adclarkia dawsonensis* is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The snail is historically known from only two populations in the Dawson Valley, north-east of Taroom, central Queensland. One population occurs in a 0.75 ha patch of boggomoss habitat on Mt Rose Station, c.45 km north-east of Taroom. A second population is known from a 44.5 ha patch of riparian habitat at the Isla-Delusion Road crossing of the Dawson River, about 35 km downstream of the boggomoss.

The projected impoundment of the proposed Nathan Dam will inundate the population located on the boggomoss on Mt Rose Station.

In response to this proposed action, translocation of the Mt Rose population is considered a crucial mitigating action for the recovery of the species.

Consequently the proponent of the action, SunWater, sponsored a comprehensive survey for the snail and potential snail habitats in the environs of the Dawson River between Taroom and Theodore.

The aim of the survey being to:

- locate any additional populations of the Boggomoss Snail within the Dawson River Valley;
- assess the condition of the existing Boggomoss Snail populations;
- obtain additional information about the habitat and microhabitat requirements of the Boggomoss Snail that could assist in the conduct of the translocation trials and the recovery of the species; and
- select locations for the conduct of translocation trials that could also act as sites for potential full translocation from the boggomoss should Nathan dam proceed.

The significant outcomes of the survey were as follows:

- Two new boggomoss populations of the Boggomoss Snail were discovered on Mt Rose Station and the range of the Isla-Delusion population was extended to

include additional upstream riparian habitat.

- The main Mt Rose boggomoss population is now considered the stronghold of the species. Earlier estimates of the population (< 100 individuals) have been revised to >350 individuals.
- The riparian population of the Boggomoss Snail along the Dawson at the Isla-Delusion camping and water reserve is considered to be a patchily distributed but viable population. Too few individuals were recovered from here to enable a re-estimation of population size to be made.
- The results confirm the preferred habitat of the Boggomoss Snail as the alluvial flats (floodplains) of the Dawson River between Taroom and Theodore. Historical records indicate that gilgaied brigalow communities inhabited black soil alluvium along the Dawson and probably formed the core area of historic distribution. This is supported by the habitat preference of its sister species.
- The preferred microhabitat of the species appears to be deep, moist, accumulated litter. Under fallen timber is also a source of living space for the species.
- Three sites have been suggested for the conduct of translocation trials. These comprise test sites in riparian and brigalow habitat and a control location in the existing boggomoss habitat.
- The Mt Rose boggomoss population is considered a robust source population from which snails can be taken for the translocation trials without threatening the existing population.

# RESULTS OF BOGGOMOSS SNAIL SURVEY

## Nathan Dam Project, Taroom

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## 1.0 INTRODUCTION

The Boggomoss Snail *Adclarkia dawsonensis* is listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A Recovery Plan for the Boggomoss Snail was prepared by Dr John Stanisic and came into force in July 2008 (Stanisic 2008).

Only two populations of the snail are currently known from locations in the Dawson Valley, north-east of Taroom, south-east Queensland (Stanisic 1996). One population (initially estimated at < 500 individuals) is confined to a 44.5 ha patch of riparian habitat at the Isla-Delusion Road crossing of the Dawson River, while a second population (initially estimated at < 100 individuals) lives in an 0.75 ha patch of boggomoss habitat on Mt Rose Station, c.45 km north-east of Taroom.

The projected impoundment of the proposed Nathan Dam, to be built on the Dawson River east of Taroom, will inundate the population located on the boggomoss on Mt Rose Station.

The proposal for the dam was declared a controlled action under the provisions of the EPBC Act. As such, the project is dependent upon approval from the Minister (Department of Environment, Heritage, Water and the Arts [DEWHA]) whose responsibility it is to ensure that the project is consistent with the intentions of the Recovery Plan.

Translocation of the Mt Rose population was proposed as a crucial mitigating action to minimise the impacts of the dam on the Boggomoss Snail in the Recovery Plan for the species (Stanisic 2008).

In order to demonstrate that successful translocation could be achieved DEWHA has suggested SunWater conduct a translocation

trial, under the supervision of the Recovery Team for the species, to determine the feasibility of this option.

The proposed translocation trial would involve the movement of individuals from the Mt Rose population to one or more of the sites considered to be suitable habitat and which will not be directly affected by the Nathan Dam project.

However, basic data on the abundance, distribution and ecology of the Boggomoss Snail are lacking. No detailed survey for the snails has been conducted since 1997 and the population estimates of the time were based on the capture of only 18 live snails in a limited number of habitats. Some of these issues would need to be addressed as part of the translocation feasibility investigation.

Hence, SunWater contracted Dr John Stanisic to conduct a survey for the Boggomoss Snail with the following aims:

- to determine if the Boggomoss Snail exists at other locations within the Dawson River Valley;
- to assess the condition of the existing Boggomoss Snail populations in an effort to more accurately estimate population sizes;
- to obtain additional information about the habitat and microhabitat requirements of the Boggomoss Snail that would assist in the conduct of translocation trials and the recovery of the species; and
- to select locations based on the above for the conduct of translocation trials that may also act as sites for potential translocation.



**The Boggomoss Snail (sub-adult)**



## **2.0 SURVEY TIMING, METHODOLOGY AND LOCATION**

### **2.1 TIMING**

The survey was carried out over two 9-day periods from 7 to 16 October 2008 and 24 November 2008 to 3 December 2008 by staff of BAAM Pty Ltd assisted on the first survey period by staff from SKM.

Weather conditions on both occasions were variable ranging from hot and dry to cool, wet and raining. Conditions for snail collecting were excellent. There was little evidence of aestivation among the many snails found, indicating that they had been activated by a recent rain event that occurred just prior to the first survey.

### **2.2 METHODOLOGY**

Access to all sites was either by local roads or canoe, and then on foot. Where practicable at least 100 m linear transect was searched. Searching involved turning ground debris (timber and palm fronds) and raking through any accumulated leaf litter. Boggomoss Snail presence was recorded. At the known habitat on Mt Rose station searching was very targeted in order to reduce potential impact on the snails present.

Search effort was quantified as the total person hours spent at each site. The general features of each site were described and the main floristic features recorded.

Microhabitat structure was noted in terms of the main elements of forest floor debris and the level of accumulated litter. Fire damage and flood impacts were noted.

The presence of other land snails was recorded as a measure of habitat suitability for snail habitation.

As an adjunct to the snail survey, a brief mammal trapping program was conducted at the Mt Rose and Isla-Delusion sites to establish the level of potential risk from predators, such as mice and rats.

### **2.3 LOCATION**

Fifty-two sites were searched for the presence of the Boggomoss Snail. These sites are described in detail in the following section. Their locations in relation to the dam inundation are shown in Figure 3.1. Survey sites from this and previous surveys, and all Boggomoss Snail records (including historical records), are shown in Figure 3.2. Search effort and numbers of boggomoss snails recorded in this and previous surveys are compiled in Table 3.1.

### 3.0 RESULTS

**Cabbage Tree Creek (Site 1)** (equivalent to BS 38, BS 70 of Ingram and Stanisic, 1997).

**Location.** 25.42836°S, 150.17079°E (altitude 154 m). **Search time.** 8 person hours.

**Description.** A tributary of the Dawson located downstream of the proposed dam wall. The upper reaches course through largely cleared, open woodland and the middle and lower reaches were bordered by steep walled sandstone cliffs. The survey site was located 200-300 m upstream of the intersection with the Dawson River where the banks are approximately 15 m wide. There was evidence of scouring.

**Vegetation.** Canopy/Mid Stratum: *Ficus coronata*, *Ficus opposita*, *Livistona nitida*, *Eucalyptus camaldulensis*, *Lophostemon suaveolens*. Ground Stratum: *Panicum maximum*, *Stephania japonica*.

**Microhabitat structure.** Ground strata consisted of *Livistona* palm fronds, thin layers of accumulated litter among the stands of sandpaper figs and around the gum trees.

**Snails found.** Camaenidae sp. A, *Figuladra mattea*, *Eremopeas tuckeri*.

**Significant habitat characteristics.** Good canopy coverage. Narrow riparian corridor subject to intermittent flooding.



### **Price Creek (Site 2).**

**Location.** 25.4656°S, 150.1178°E (altitude 140 m). **Search time.** 8 person hours.

**Description.** A tributary of the Dawson intersecting with it immediately downstream of the proposed dam wall. The upper and middle reaches course through cleared, open woodland. The lower reaches are bordered by moderately steep walled sandstone cliffs with very little riparian vegetation, before spilling out onto a large floodplain. Here the banks of the creek were very wide and the Dawson separated into several beds separated by a series of vegetated raised levees. The survey site examined a 30 m stretch of Price Creek upstream of the Dawson as well as 50 m of the Dawson either side of the confluence. There

was extensive evidence of scouring of tree roots.

**Vegetation.** Canopy/Mid Stratum: *Ficus coronata*, *Eucalyptus coolabah*, *Eucalyptus camaldulensis*, *Melaleuca bracteata*. Ground Stratum: *Panicum maximum*, *Imperata cylindrica*, *Lomandra longifolia*.

**Microhabitat structure.** Very little timber and accumulated litter.

**Snails found.** *Trachiopsis mucosa*, *Neveritis misella*, *Eremopeas tuckeri*, *Stenopylis coarctata*, Hydrobiidae sp. A (freshwater species).

**Significant habitat characteristics.** Large riparian corridor. Poor microhabitat structure and subject to intermittent flooding.



**Palm Tree Creek (Site 3).** (equivalent to BS 76, AD 12 of Ingram and Stanisc, 1997)

**Location.** 25.49803°S, 149.77739°E (altitude 196 m). **Search time.** 6 person hours.

**Description.** A tributary of the Dawson River located upstream of the proposed dam wall. The creek's lower reaches will be affected by the dam impoundment. The upper reaches form an extensive lagoonal system to the northeast of Taroom.

The survey site was located on the eastern side of the main Taroom-Theodore Road where it crossed the creek. A 100 m stretch of the riparian corridor was sampled.

**Vegetation.** Canopy/Mid Stratum: *Eucalyptus camaldulensis*, *Corymbia tessellaris*, *Livistona nitida*, *Ficus opposita*. Ground Stratum: *Panicum maximum*, *Pennisetum ciliaris*, *Sida cordifolia*, *Sida subspicata*.

**Microhabitat structure.** Some scattered timber and many *Livistona* palm fronds; some accumulated litter among the scattered sandpaper figs and around the gum trees

**Snails found.** *Figuladra mattea*.

**Significant habitat characteristics.** A comparatively open-canopied riparian corridor. Poor microhabitat structure and subject to flooding.



**Lake Murphy (Site 4).** (equivalent to BS 37, AD 9 of Ingram and Stanisic, 1997)

**Location.** 25.48399°S, 149.65916°E (altitude 195 m). **Search time.** 6 person hours.

**Description.** A major tributary located upstream of the proposed dam. The upper reaches of the creek are located in the Robinson Gorge.

The lower reaches form an extensive floodplain to the northeast of Taroom taking in the environs of Lake Murphy. The survey site was located adjacent to Lake Murphy.

**Vegetation.** Canopy/Mid Stratum: *Eucalyptus coolabah*, *Corymbia tessellaris*, *Livistona*

*nitida*, *Geijera parviflora*. Ground Stratum: *Pennisetum ciliaris*, *Sida cordifolia*, *Sida rhombifolia*, *Eremophila debilis*.

**Microhabitat structure.** Much scattered timber (largely burnt) but little accumulated litter. This site is prone to fire due to the dry open nature of the habitat and this may account for the lack of ground litter.

**Snails found.** Camaenidae sp. A.

**Significant habitat characteristics.** Open grassy woodland. Poor microhabitat structure and subject to fire.



**Cockatoo Creek on Taroom-Cracow Rd (Site 5).** (equivalent to BS 40, AD 14 of Ingram and Stanisc, 1997)

**Location.** 25.56774°S, 150.07099°E (altitude 178 m). **Search time.** 4 person hours.

**Description.** A tributary of the Dawson River located upstream of the proposed dam wall. The upper reaches course through largely cleared, open woodland. The middle and lower reaches are to be flooded by the proposed dam. The survey site was located along the upper reaches adjacent to the Taroom-Cracow Rd.

**Vegetation.** Canopy/Mid Stratum: *Eucalyptus populnea*, *Eucalyptus tereticornis*, *Melaleuca*

*bracteata*. Ground Stratum: *Panicum maximum*, *Pennisetum ciliaris*, *Sida rhombifolia*, *Sida cordifolia*, *Sida subspicata*, *Verbena tenuisecta*.

**Microhabitat structure.** Scattered timber and very little accumulated litter; extensive piles of flood debris against tree trunks adjacent to the creek.

**Snails found.** *Trachiopsis mucosa*, *Neveritis misella*, *Eremopeas tuckeri*, *Figuladra mattea*, Charopidae sp. A.

**Significant habitat characteristics.** Open and narrow riparian corridor. Very poor microhabitat and subject to intermittent flooding and cattle grazing.



**Dawson River environs upstream of stock and camping reserve (Sites 6, 7, 8).**

**Locations.** Along Dawson River from 25.1932°S, 150.1962°E to 25.3382°S, 150.1628°E (altitude 160 m). **Search time.** 90 person hours.

**Description.** A number of sites were searched upstream from the camping area at the Isla-Delusion Rd crossing to the Nathan Gorge. Here the banks of the Dawson River are narrow to wide and support a *Livistona*/eucalypt association with scattered sandpaper figs grading to open woodland in places. The size of these habitat patches is variable.

**Vegetation.** Canopy/Mid Stratum: *Ficus coronata*, *Ficus opposita*, *Livistona nitida*, *Eucalyptus camaldulensis*, *Eucalyptus coolabah*, *Melaleuca bracteata*. Ground Stratum: *Panicum maximum*, *Pennisetum ciliaris*, *Sida cordifolia*, *Sida subspicata*

**Microhabitat structure.** Dominated by *Livistona* palm fronds with some scattered timber and small amounts of accumulated litter.

**Snails found.** *Adclarkia dawsonensis* (1 live sub-adult, 4 sub-adult dead shells), Rhytididae sp. A. (carnivore), *Figuladra mattea*, *Camaenidae* sp. A., *Xanthomelon pachystylum*, *Trachiopsis mucosa*, *Neveritis misella*, *Eremopeas tuckeri*, *Elsothera hewittorum*, *Notopala* sp. (freshwater species), *Glyptophysa gibbosa* (freshwater species).

**New Boggomoss Snail locality (Site 8).** 25.2081°S, 150.2026°E. Comprising a large stand of remnant riparian forest up to 100 m wide.

**Significant habitat characteristics.** Large riparian corridor. *Livistona* palm fronds, scattered timber but little accumulated leaf litter; subject to flooding.



**Dawson River environs in stock and camping reserve at the Isla-Delusion Rd crossing (Sites 9-13).**

**Locations.** 25.18082°S, 150.18325°E; 25.18112°S, 150.18282°E; 25.18115°S, 150.18338°E (boggomoss snail location); 25.18378°S, 150.18765°E; 25.18255°S, 150.18847°E (altitude 169-196 m). **Search time.** 30 person hours (excluding boggomoss snail locality).

**Description.** A number of sites along the length of the stock and camping reserve were surveyed. The banks of the Dawson graded from steep and narrow at the northern end to moderately wide and sloping at the Isla-Delusion Rd. Here the banks merged into an extensive alluvial floodplain about dominated by stands of *Livistona* palm (up to 100 m wide). Some areas showed signs of fire damage.

**Vegetation.** Canopy/Mid Stratum: *Melia azedarach*, *Ficus coronata*, *Ficus opposita*,

*Livistona nitida*, *Eucalyptus camaldulensis*, *Corymbia tessellaris*. Ground Stratum: *Panicum maximum*.

**Microhabitat structure.** A dense accumulation of *Livistona* palm fronds in some areas with little accumulated litter and timber.

**Snails found.** *Adclarkia dawsonensis* (3 live sub-adults under timber), *Figuladra mattea*, *Camaenidae* sp. A., *Xanthomelon pachystylum*, *Trachiopsis mucosa*, *Neveritis misella*, *Rhytididae* sp. A. (carnivore), *Eremopeas tuckeri*, *Elsothera hewittorum*, *Notopala* sp. (freshwater species).

**Boggomoss Snail locality (Site 11).** 25.18115°S, 150.18338°E (see next section).

**Significant habitat characteristics.** Large riparian corridor. Many *Livistona* palm fronds, scattered timber but little accumulated leaf litter. Subject to fire and flooding..



**Dawson River crossing on the Isla-Delusion Rd: Known Boggomoss Snail locality (Site 11).** (equivalent to AD 4 of Ingram and Stanisic, 1997).

**Location.** 25.18115°S, 150.18338°E (altitude 163 m). **Search Time.** 16 person hours.

**Description.** The banks of the Dawson here were moderately wide and merge into an expansive alluvial floodplain. The area showed extensive signs of fire damage.

**Vegetation.** Canopy/Mid Stratum: *Melia azedarach*, *Ficus coronata*, *Ficus opposita*, *Livistona nitida*, *Eucalyptus camaldulensis*, *Corymbia tessellaris*. Ground Stratum: *Panicum maximum*.

**Microhabitat structure.** A dense accumulation of *Livistona* palm fronds in some areas with little accumulated litter and some timber (mostly burnt).

**Snails found.** *Adclarkia dawsonensis* (3 live sub-adults under timber), Rhytididae sp. A. (carnivore), *Figuladra mattea*, *Xanthomelon pachystylum*, *Eremopeas tuckeri*, *Elsothera hewittorum*, *Notopala* sp. (freshwater species).

**Significant habitat characteristics.** Large riparian corridor. Scattered *Livistona* palm fronds and timber but little accumulated leaf litter. Part of the camping and water reserve.



**Dawson River Anabranh, Theodore (Site 18).** (equivalent to AD 1 of Ingram and Stanisic, 1997).

**Location.** 24.94164°S, 150.05915°E (altitude 140 m). **Search time.** 4 person hours.

**Description.** *Livistona*/eucalypt dominated riparian habitat.

**Vegetation.** Canopy/Mid Stratum: *Ficus coronata*, *Ficus opposita*, *Livistona nitida*, *Eucalyptus camaldulensis*, *Corymbia tessellaris*. Ground Stratum: *Panicum maximum*.

**Microhabitat structure.** Scattered timber among tall grass. No accumulation of litter.

**Snails found.** *Figuladra mattea*.

**Significant habitat characteristics.** Large riparian corridor. Scattered timber among tall grass. Subject to intermittent flooding.

**Delusion Creek, c.3km east of Isla-Delusion Rd crossing (Site 19).**

**Location.** 25.1758°S, 150.1963°E (altitude 170 m). **Search time.** 4 person hours.

**Description.** *Livistona*/eucalypt dominated riparian habitat.

**Vegetation.** Canopy/Mid Stratum: *Melia azedarach*, *Ficus coronata*, *Ficus opposita*, *Livistona nitida*, *Eucalyptus camaldulensis*, *Corymbia tessellaris*. Ground Stratum: *Panicum maximum*.

**Microhabitat structure.** Scattered timber among tall grass. No accumulation of litter.

**Snails found.** *Figuladra mattea*, *Xanthomelon pachystylum*.

**Significant habitat characteristics.** Large riparian corridor. Scattered timber among tall grass. Subject to intermittent flooding.

**Mt Rose boggomoss: Known Boggomoss Snail locality (Site 14).** (equivalent to BM 8, BS 17 of Ingram and Stanistic, 1997).

**Location.** 25.45235°S, 150.02848°E (altitude 173 m). **Search time.** 12 person hours.

**Description.** Refugial alluvial flat habitat.

**Vegetation.** Canopy/Mid Stratum: *Ficus coronata*, *Ficus opposita*, *Eucalyptus camaldulensis*, *Brachychiton australis*, *Alstonia constricta*. Ground Stratum: *Imperata cylindrica*, *Panicum maximum*.

**Microhabitat structure.** Accumulation of piles of dense moist litter around the bases of gum trees and sandpaper figs. Numerous bits of timber scattered among tall grass.

**Snails found.** *Adclarkia dawsonensis* ( 2 live sub-adults and 20 live juveniles; 209 dead shells consisting of 41 adults, 130 sub-adults and 38 juveniles.), *Deroceras panoritanum*. Other species were recorded here by Ingram and Stanistic (1997) chiefly from sorted leaf litter. No leaf litter was taken for sorting on this occasion.

**Significant habitat characteristics.** Scattered timber and large amounts of accumulated leaf litter around the bases of gum trees and

sandpaper figs. Location of these is shown in Figure 4.1.

#### **Assessment of Boggomoss Snail**

**population.** Six microhabitats on the main Mt Rose boggomoss were searched in order to assess the size of the Boggomoss Snail population. These comprised litter around four sandpaper figs and litter around two sandpaper figs growing next to gum trees. All were located on the boggomoss. Two hundred and thirty-one Boggomoss Snails (22 live and 209 dead shells) were collected. The live juveniles were first season recruits and confirmed this population as a viable breeding population.

A revised estimate of the population size based on these figures is presented in Section 4.0 of this report.

The dead shells showed a high level of predation spread across all size cohorts (31 adults, 80 sub-adults, 21 juveniles) presumably by mice (*Mus musculus*) and rats (*Rattus fuscipes*). These were caught in the trapping program conducted on the boggomoss during the survey period.







**Mt Rose boggomoss (Site 15).** (equivalent to BM 17, BS 23 of Ingram and Stanisc, 1997).

**Location.** 25.4522°S, 150.0208°E (altitude 170 m). **Search time.** 4 person hours.

**Description.** Refugial alluvial flat habitat.

**Vegetation.** Canopy/Mid Stratum: *Ficus coronata*, *Ficus opposita*, *Eucalyptus camaldulensis*, Ground Stratum: *Imperata cylindrica*, *Panicum maximum*.

**Microhabitat structure.** Small accumulations of dense moist litter around gum trees and sandpaper figs. Numerous bits of timber scattered among tall grass.

**Snails found.** *Adclarkia dawsonensis* (1 live sub-adult, 2 live juveniles under timber among grass), *Figuladra mattea*, *Eremopeas tuckeri*.

**Significant habitat characteristics.** Scattered timber and accumulated leaf litter around the base of gum trees and sandpaper figs



**Mt Rose boggomoss (Site 16).** (equivalent to BM 15, BS 22 of Ingram and Stanisc, 1997).

**Location.** 25.4563°S, 150.0212°E (altitude 170 m). **Search time.** 4 person hours.

**Description.** Refugial alluvial flat habitat.

**Vegetation.** Canopy/Mid Stratum: *Ficus coronata*, *Ficus opposita*, *Eucalyptus camaldulensis*, Ground Stratum: *Imperata cylindrica*, *Panicum maximum*.

**Microhabitat structure.** Small accumulations of dense moist litter around gum trees and sandpaper figs. Numerous bits of timber scattered among tall grass.

**Snails found.** *Adclarkia dawsonensis* (2 live sub-adults, 2 live juveniles among pushed timber immediately adjacent to boggomoss).

**Significant habitat characteristics.** Scattered timber and accumulated leaf litter around the base of gum trees and sandpaper figs.



**Mt Rose boggomoss (Site 17).** (equivalent to BM 7, BS 19 of Ingram and Stanisic, 1997).

**Location.** 25.4591°S, 150.287°E (altitude 170 m). **Search time.** 2 person hours.

**Description.** Refugial alluvial flat habitat.

**Vegetation.** Canopy/Mid Stratum: *Ficus coronata*, *Ficus opposita*, *Eucalyptus camaldulensis*, Ground Stratum: *Imperata cylindrica*, *Panicum maximum*.

**Microhabitat structure.** Small accumulations of dense moist litter around gum trees and sandpaper figs. Numerous bits of timber scattered among tall grass.

**Snails found.** No snails recorded.

**Significant habitat characteristics.**

Scattered timber and some accumulated leaf litter around the base of gum trees and sandpaper figs



### **Cockatoo Creek-Sandy Creek (Sites 20-23)**

**Location.** 4 sites: 25° 43.371'S, 150° 14.501'E; 25° 43.066'S, 150° 14.471'E; 25° 43.437'S, 150° 13.630'E; 25° 43.274'S, 150° 13.371'E (altitude 226-228m). Search time. 12 person hours.

**Description.** Sandy Creek is a tributary of Cockatoo Creek and has several boggomosses situated along its length. These boggomosses are largely reed beds with an associated water body. The area surrounding these boggomosses is vegetated with sparse tall trees and shrubs.



**Vegetation.** Canopy/Mid Stratum: *Eucalyptus tereticornis*, *E. populnea*, *Angophora woodsiana*, *Alstonia constricta*, *Geijera parviflora*, *Melaleuca linariifolia*, *Allocasuarina luehmannii*, *Eremophila bignoniiflora*. Ground Stratum: *Heteropogon contortus*, *Verbena tenuisecta*, *Sida rhombifolia*.

**Microhabitat structure.** Poor with very little accumulated litter.

**Snails found.** Camaenidae sp. A, *Figuladra mattea*, *Erelopeas tuckeri*.

**Significant habitat characteristics.** Open canopy. Sparsely vegetated riparian corridors characterised by high energy water flow.





### **Price Creek (middle reaches) (Site 24)**

**Location.** 1 site: 25° 29.270'S, 150° 08.155'E (altitude 200m). **Search time.** 3 person hours.

**Description.** A tributary of the Dawson River intersecting with it immediately downstream of the proposed dam wall. The middle reaches course through cleared, open woodland. The creek banks are lined with stands of cabbage palms and emergent eucalypts.

**Vegetation.** Canopy/Mid Stratum: *Eucalyptus camaldulensis*, *E. populnea*, *Acacia*

*harpophylla*, *Livistona nitida*, *Casuarina cristata*, *Santalum lanceolatum*. Ground Stratum: *Cenchrus ciliaris*, *Schoenoplectus mucronatus*, *S. validus*.

**Microhabitat structure.** *Livistona* palm fronds; very little accumulated timber and litter.

**Snails found.** *Figuladra mattea*, *Trachiopsis mucosa*, *Erelopeas tuckeri*

**Significant habitat characteristics.** Open canopy with very little accumulated ground debris. Evidence of high energy water flow.



**Cabbage Tree Creek (middle reaches) (Site 26)**

**Location.** 1 site: 25° 29.580'S, 150° 12.096'E (altitude 160m). Search time. 4 person hours.

**Description.** A tributary of the Dawson River downstream of the proposed dam wall. The middle reaches are characterised by steeply sided banks flanked by sandstone walls. The search site was located near a bend where one bank opened onto a small plain dominated by cabbage palms and emergent eucalypts.

**Vegetation.** Canopy/Mid Stratum: *Eucalyptus tereticornis*, *E. melanophloia*, *Corymbia erythrophloia*, *Angophora woodsiana*, *Melaleuca linariifolia*, *Livistona nitida*. Ground Stratum: *Imperator cylindrica*.

**Microhabitat structure.** *Livistona* palm fronds; very little accumulated timber and litter.

**Snails found.** *Figuladra mattea*, *Trachiopsis mucosa*, Charopid sp. *Eremopeas tuckeri*

**Significant habitat characteristics.** Open canopy with very little accumulated ground debris. Evidence of high energy water flow.



### **Palm Tree Creek (Sites 27-28)**

**Location.** 2 sites: 25° 19.631'S, 149° 44.066'E; 25° 32.702'S, 149° 48.702'E (altitude 191-192m). **Search time.** 12 person hours.

**Description.** A tributary of the Dawson River located upstream of the proposed dam wall. The creek's lower reaches will be affected by the dam impoundment. The sites were located around the 'Chain Lagoon' and near a boggomoss on Rosedale Station. The riparian corridor of both sites was characterised by a narrow zone of cabbage palms and emergent eucalypts.



**Vegetation.** Canopy/Mid Stratum: *Eucalyptus camaldulensis*, *E. tereticornis*, *E. coolabah*, *Corymbia tessellaris*, *Livistona nitida*. Ground Stratum: *Heteropogon contortus*, *Lomandra longifolia*.

**Microhabitat structure.** Some scattered timber and many *Livistona* palm fronds. Some accumulated litter around the gum trees

**Snails found.** *Figuladra mattea*.

**Significant habitat characteristics.** Open canopy, poor litter layer.





**Robinson Creek (Sites 29-29A)** (equivalent to sites AD 10, AD 11 of Ingram and Stanisic 1997)

**Location.** 2 sites: 25° 29.333'S, 149° 41.527'E; 25° 29.158'S, 149° 42.219'E (altitude 199-207m). **Search time.** 12 person hours.

**Description.** A major tributary of the Dawson located upstream of the proposed dam wall. The upper reaches of the creek are located in the Robinson Gorge. The area in which the sites are located is a floodplain dominated by cabbage palms and river gums.

**Vegetation.** Canopy/Mid Stratum: *Eucalyptus tereticornis*, *E. orgadophila*, *Angophora floribunda*, *Livistona nitida*. Ground Stratum: *Cyperus* spp., *Sida rhombifolia*.

**Microhabitat structure.** Dominated by *Livistona* fronds and some scattered timber; very little accumulated litter.

**Snails found.** Camaenidae sp. A., *Figuladra mattea*.

**Significant habitat characteristics.** Open canopy; very little accumulated litter.



### **Dawson River (Sites 30-31)**

**Location.** 2 sites: 25° 20.352'S, 150° 09.612'E; 25° 19.087'S, 150° 10.252'E (altitude 160-170m). **Search time.** 12 person hours.

**Description.** The two sites were located along the left bank of Dawson downstream of the Nathan Gorge. The riparian corridor characterised by cabbage palms was in areas interrupted by semi-deciduous vine thicket on volcanic soil. In some places this thicket community dominated to the river's edge. Upstream from here the banks of the Dawson became very narrow and were vegetated by a *Livistona*/vine thicket association which was not considered to be good habitat for the Boggomoss Snail.

**Vegetation.** Canopy/Mid Stratum: *Eucalyptus camaldulensis*, *E. orgadophila*, *Ficus opposita*, *Livistona nitida*, *Lysiphyllum* sp. Ground Stratum: *Lomandra longifolia*, *Sida rhombifolia*, *Heliotrope* sp.

**Microhabitat structure.** Scattered timber and very little accumulated litter; extensive mats of *Livistona* fronds.

**Snails found.** *Figuladra mattea*, *Xanthomelon pachystylum*, *Sphaerospira mossmani*, *Camaenidae* sp. A, *Helicarionidae* sp. A.

**Significant habitat characteristics.** Open *Livistona*/eucalypt association interrupted by vine thicket. Very poor microhabitat structure, with little leaf litter.





**Boggomosses (Boggomoss Reserve) (Sites 32-46)** (equivalent to sites BS 1-7, BS 32 of Ingram and Stanisic 1997).

**Location.** 15 sites: 25° 25.712', 150° 01.270'E; 25° 25.802'S, 150° 01.295'E; 25° 25.389'S, 150° 01.311'E; 25° 25.885'S, 150° 01.311'E; 25° 25.893'S, 150° 01.385'E; 25° 25.984'S, 150° 01.374'E; 25° 25.642'S, 150° 01.356'E; 25° 25.929'S, 150° 01.515'E; 25° 25.978'S, 150° 01.524'E; 25° 26.035'S, 150° 01.514'E; 25° 26.216'S, 150° 01.466'E; 25° 26.299'S, 150° 01.549'E; 25° 26.142'S, 150° 01.408'E; 25° 26.192'S, 150° 01.409'E; 25° 26.073'S, 150° 01.572'E (altitude 181-196m). **Search time.** 20 person hours.

**Description.** The fifteen boggomosses were largely vegetated by reeds and grasses and in a few cases *Leptospermum juniperinum*. The surrounding landscape consisted of a mix of vegetation which included river gum, poplar

box, brigalow and wilga. Much of this vegetation was regrowth.

**Vegetation.** Canopy/Mid Stratum: *Eucalyptus camaldulensis*, *E. tereticornis*, *E. coolabah*, *E. populnea*, *Acacia harpophylla*, *A. salicina*, *Geijera parviflora*. Ground Stratum: *Imperata cylindrica*, *Lomandra longifolia*, *Heteropogon contortus*, *Themeda triandra*, *Verbena tenuisecta*, *Phragmites australis*.

**Microhabitat structure.** Very little scattered timber and very little accumulated litter.

**Snails found.** *Figuladra mattea*, *Trachiopsis mucosa*, *Neveritis misella*, *Eremopeas tuckeri*.

**Significant habitat characteristics.**

Boggomosses with very poor vegetation structure. Surrounding areas with chiefly open canopy and poor ground litter.





**Boggomoss Stn (Sites 47-49)** (equivalent to sites BS 27-30 of Ingram and Stanisic 1997).

**Locations.** 3 sites: 25° 24.943'S, 150° 01.410'E\*; 25° 25.012'S, 150° 01.519'E; 25° 25.597'S, 150° 01.689'E (altitude 204-210m).

**Search time.** 5 person hours.

**Description.** Three boggomosses located within close proximity. The largest is dominated by large trees and a substrate layer of bungwhal fern. The smaller two have scattered river gums with a largely open, debris free ground layer.

**Vegetation.** Canopy/Mid Stratum:  
*Lophostemon suaveolens*, *Eucalyptus*

*tereticornis*, *Ficus opposita*. Ground Stratum:  
*Lomandra longifolia*, *Fimbristylis dichotoma*,  
*Carex appressa*, *Blechnum nudum*

**Microhabitat structure.** A dense matting of fern roots; accumulation of litter around some eucalypts.

**Snails found.** *Figuladra mattea*.

**Significant habitat characteristics.**  
Dominated by Bungwhal fern with roots forming a dense interwoven mat; scattered eucalypts with some accumulated litter at their bases.



### **Spring Creek Station (Sites 50-53)**

**Location.** 4 sites: 25° 27.692'S, 150° 06.412'E; 25° 27.095'S, 150° 06.560'E; 25° 27.587'S, 150° 05.177'E; 25° 26.605'S, 150° 04.421'E (altitude 169-213m). **Search Time.** 16 person hours.

**Description.** The sites on Spring Creek station varied from riparian, to *Callitris/eucalypt* association to degraded softwood scrub.

**Vegetation.** Canopy/Mid Stratum: *Eucalyptus tereticornis*, *E. orgadophila*, *Corymbia*

*tessellaris*, *Callitris glaucophylla*. Ground Stratum: *Verbena tenuisecta*, *Cenchrus ciliaris*.

**Microhabitat structure.** Scattered timber; cattle trampled ground with little accumulated litter.




**Snails found.** *Figuladra mattea*, *Eremopeas tuckeri*, *Themapupa pacifica*, *Gastrocopta hedleyi*, *Pumilicopta bifurcata*.

**Significant habitat characteristics.** .Very open ground layer with little accumulated litter



**Figure 3.1**  
Sampling Site Locations in  
relation to the inundation  
zone

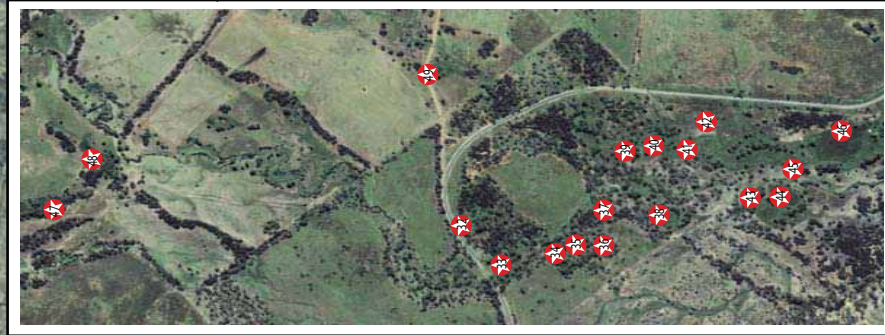
**Legend**

-  Survey Site (Boggomoss Snail Observed)
-  Survey Site (Boggomoss Snail Not Observed)
-  Area of inundation

Survey Sites 47-49

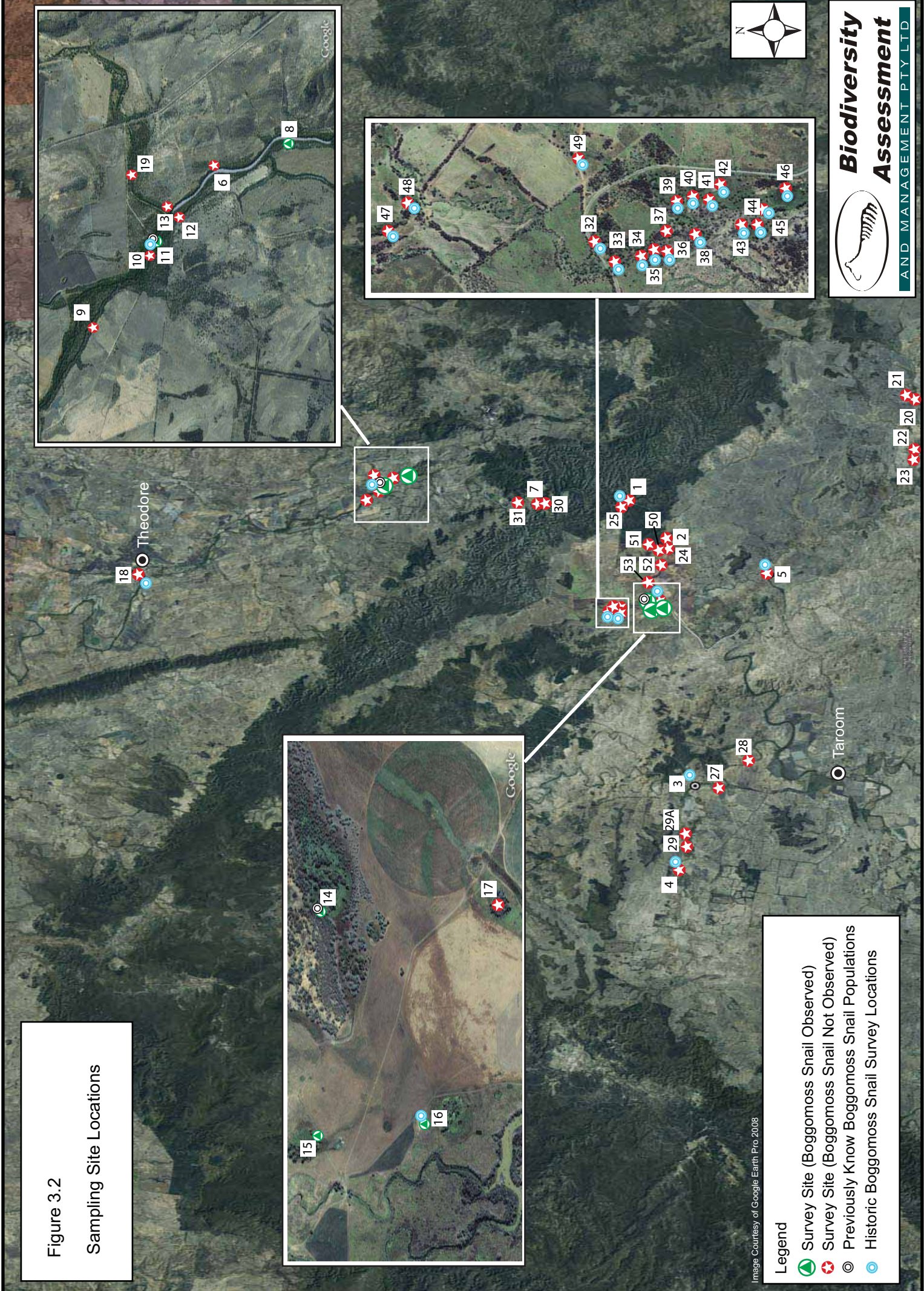
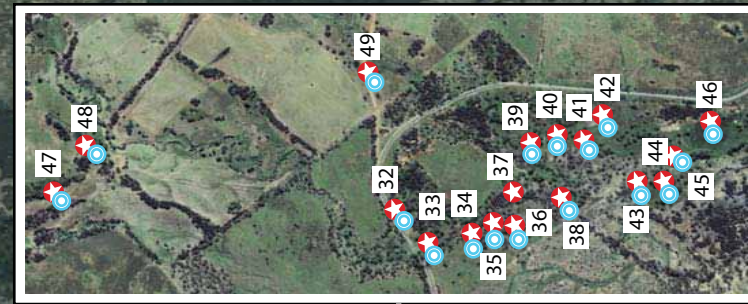
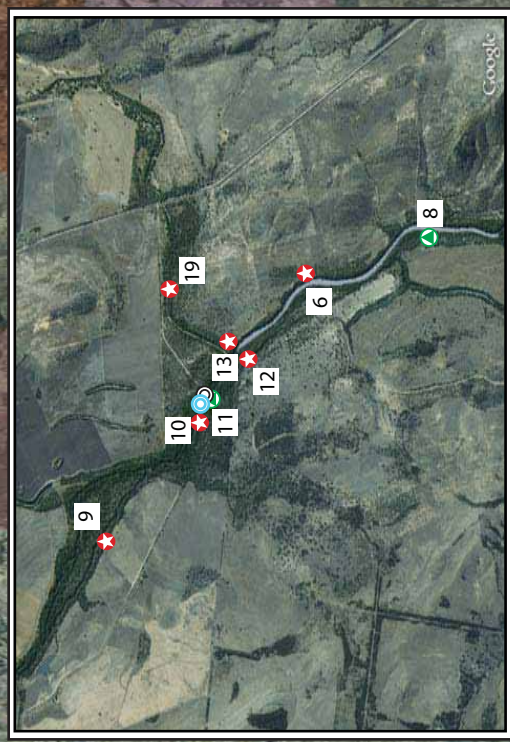
Survey Sites 32-46

Survey Sites 6, 8-13, 18  
and 19 are located down-  
stream of the dam.  
Boggomoss snails were  
located at riparian habitat  
at Sites 8 and 11.



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Figure 3.2  
Sampling Site Locations



- Legend**
- Survey Site (Boggomoss Snail Observed)
  - Survey Site (Boggomoss Snail Not Observed)
  - Previously Know Boggomoss Snail Populations
  - Historic Boggomoss Snail Survey Locations

**TABLE 3.1.** Comparative search effort and numbers of Boggomoss Snails (alive and dead) recorded on this survey and in 1995-96 (Ingram and Stanisic 1997). Grey shading indicates site not previously surveyed. [Size classes: juv. = juvenile; s-ad = sub-adult; ad = adult].

	Site Type	Current Survey				1995-1996 Surveys			
		Search effort (person hours)	No. of snails recorded	Live/dead and size class	Search effort (person hours)	No. of snails recorded	Live/dead and size class		
Site 1	Riparian	8	0		2	0			
Site 2	Riparian	8	0						
Site 3	Riparian	6	0		4	0			
Site 4	Woodland	6	0		4	0			
Site 5	Riparian	4	0		2	1	1 dead s-ad		
Sites 6-8	Riparian	90	5	1 live/4 dead s-ad/ at Site 8					
Sites 9-10	Riparian	15	0						
Site 11	Riparian	16	3	3 live s-ad	4	10	2 live ad 4 live/4 dead s-ad		
Sites 12-13	Riparian	15	0						
Site 14 (over two sampling periods)	Boggomoss	12	231	41 dead ad 2 live/130 dead s-ad 20 live/38 dead juv	20	66	2 live/2 dead ad 10 live/45 dead s-ad 7 dead juv		
Site 15	Boggomoss	4	3	2 live juv 1 live s-ad	4	0			
Site 16	Boggomoss	4	4	2 live juv 2 live s-ad	4	0			
Site 17	Boggomoss	2	0		2	0			
Site 18	Riparian	4	0		2	0			
Site 19	Riparian	4	0						
Sites 20-23	Boggomoss/riparian	12	0						
Site 24	Riparian	3	0						
Site 26	Riparian	4	0						
Sites 27-28	Riparian	12	0						
Sites 29-29A	Riparian	12	0						
Sites 30-31	Riparian/vine thicket	12	0		4	0			
Sites 32-46	Boggomoss	20	0						
Sites 47-49	Boggomoss	5	0		8	0			
Sites 50-53	Riparian/woodland	16	0		4	0			

## **4.0 RE-ASSESSMENT OF BOGGOMOSS SNAIL DISTRIBUTION, HABITAT AND MICROHABITAT REQUIREMENTS**

The survey results enable a re-assessment of the distribution, population size and environmental requirements of, and threats to, the Boggomoss Snail as they relate to the Recovery Plan (Stanisic 2008).

### **4.1 BOGGOMOSS SNAIL LOCATIONS**

Previous surveys for the Boggomoss Snail (1995-1996) confirmed its presence (as live snails) at only two sites. The present survey found live snails at five sites including the original sites. Two of the new locations were on isolated boggomosses on Mt Rose Station (Sites 15, 16) while the third was in riparian habitat along the Dawson upstream of the Isla-Delusion camping and water reserve (Sites 8).

### **4.2 BOGGOMOSS SNAIL DISTRIBUTION**

The two new locations for the Boggomoss Snail on or near boggomosses in wheat fields on Mt Rose Station must now be regarded as separate populations because of their isolation from each other and their limited chances of reconnection. They were most probably part of the same population (and including the main Mt Rose boggomoss) prior to the clearing of the intervening land for farming.

The Boggomoss Snail individuals discovered upstream of the Isla-Delusion Rd population should however, not be regarded as a new population. The habitat is contiguous (being part of the riparian corridor) with that of the water and camping reserve and as such the *Adclarkia dawsoneis* individuals must be considered part of that population.

### **4.3 POPULATION ESTIMATES**

#### **4.3.1 Site 14. Mt Rose boggomoss and type locality of the species**

Six microhabitats were selected and thoroughly searched for snails. These comprised accumulated litter around

sandpaper figs (4) and accumulated litter around sandpaper figs growing next to gum trees (2) located on or at the edge of the boggomoss.

After 12 person hours search time per microhabitat 2 live sub-adults and 20 live juveniles were found at an average 3-4 per microhabitat. The lack of live adults in the samples is most probably due to the fact that this size cohort prefers sheltering under the large logs which are strewn over the boggomoss. This microhabitat was not searched in order to minimise disturbance of the site. The live juveniles were first season recruits and indicated that it is a viable breeding population.

In addition 209 dead shells were also recovered from the latter microhabitat. These comprised 41 adults, 130 sub-adults and 38 juveniles. The shells showed a high level of predation (31 adults, 80 sub-adults, 21 juveniles) presumably by mice and rats. It should be noted that these dead shells are an accumulation of several generations of Boggomoss Snail shells.

In order to better estimate the size of this population all sandpaper figs and large gum trees were mapped (Figure 4.1). The site contained more than 100 sandpaper figs and gum trees all with accumulated litter at their bases.

Ignoring the dead shells and using the average of 3.66 live snails recovered per microhabitat sampled, there may be more than 350 individuals on this site. This is an improvement on estimates given in the Recovery Plan which was <100 individuals.

#### **4.3.2 Sites 15, 16. Other Mt Rose boggomosses**

Following the discovery of the Boggomoss Snail on these two sites in the first survey period an attempt was made to better estimate the population sizes by re-sampling the boggomosses during the second survey period. Unfortunately no additional snails were recovered and it has to be assumed that the Boggomoss Snail occurs here at very low densities.



#### Legend






-  *Eucalyptus camaldulensis*
-  *Ficus coronata / opposita*
-  *Acacia salacina*
-  *Alstonia constricta*
-  Stag Tree



Figure 4.1

Plot of trees present on the  
Mt Rose Boggomoss

Compared with the Site 14 these boggomosses have a much more open canopy, less strewn timber and only a few sandpaper figs. There was very little accumulated litter associated with these.

#### **4.3.3 Sites 6, 7, 8, 11. Riparian habitat along the Dawson River including the Isla-Delusion crossing**

At the Isla-Delusion site (Site 11) three snails were found after approximately 16 hours of searching. These were sub-adults having been born in the previous summer. There were no signs of hatchlings or dead shells.

Further upstream of the Isla-Delusion crossing but still within the same riparian corridor (Sites 6, 7, 8) one live sub-adult was recovered after 90 hours of searching.

Clearly the Boggomoss Snail is able to survive and breed in these riparian environments of the Dawson as it was found in both the 1995-1996 and current surveys. However, the snails are present in very low densities probably due to the paucity of scattered timber and accumulated litter.

The Recovery Plan (Stanisic 2008) estimated that the Isla-Delusion population comprised less than 500 individuals based largely on the area of habitat available. It is not possible to provide a better estimate given the poor recovery rate of specimens in this habitat. However, this must be regarded as less than optimal habitat based on the number of snails recovered.

#### **4.4 HABITAT AND MICROHABITAT REQUIREMENTS**

These have not altered from those given in the Recovery Plan (Stanisic 2008) as a result of observations made on the current survey.

The present survey reaffirms the preferred habitat of the species as the black soil alluvial flats (floodplain) of the Dawson River. Historically, these were an extensive archipelago of habitats supporting a locally circumscribed vegetation community located between the stream-bound riparian habitats dominated by *Livistona nitida* and the drier scrubs of the surrounding hillsides.

In this context, the Mt Rose boggomoss environments (where the main mass of the species is located) are refugial remnants of these habitats maintained by the moisture from the associated aquifer.

That the relatively thin-shelled Boggomoss Snail is able to survive near the boggomoss is due to a combination of the moist environment (maintained through good ground cover and a relatively closed canopy) and the accumulation of deep litter and timber.

Secondarily the species may exist as scattered individuals along the stream-bound riparian habitats of the nearby Dawson. This habitat does not provide the accumulation of the moist dense litter found on the boggomosses probably because of the effects of intermittent flooding. (This may also account for the lack of dead shells). They are however, moist habitats with scattered fallen logs which provide the snail with shelter and foraging sites. (**N.B.:** Of the 1200 or more species of land snail known from eastern Australia, not one utilises riparian habitat as a primary habitat).

**Microhabitat.** The present survey indicates very strongly that the critical environmental requirement of the species is deep, moist litter and fallen timber. These provide food, shelter and egg-laying sites for the snail. A closed or relatively closed canopy appears vital to maintaining a stable moist environment.

#### **4.5 THREATS**

**Predation.** The large numbers of damaged shells uncovered on the Mt Rose boggomoss suggest that predation may be a significant threat to the species. A study of the damage pattern exhibited by the shells suggests that the predator is mammalian.

The results of the brief trapping program conducted at the Mt Rose and Isla-Delusion sites showed that mice (*Mus musculus*) and rats (*Rattus fuscipes*) were the dominant mammals present with these species being caught in more than 50% of traps (total trapping effort: 2 lines X 28 traps over four nights).

**Fire.** Fire is a major threat. Grass growth on the main Mt Rose boggomoss is extremely high and could be easily ignited by lightning strikes. The controlled release of stock over short time periods has been used as a means of reducing this threat.

**Flooding.** In the riparian habitats, particularly at the level of the lower levee along the Dawson, flooding is a perennial threat to any snails that might inhabit these zones.

**Reduced aquifer flows.** Alteration to the aquifer flow which might result in a drying of the habitat and consequent loss of vital vegetative elements is seen as a further threat.

**Stock grazing.** Trampling and grazing by stock eg. cattle is a major threat to the Boggomoss Snail. In the long term this will result in significant habitat alteration reducing ground cover. Significantly the Mt Rose boggomosses and parts of the Isla-Delusion camping and water reserve where the Boggomoss Snail occurs are fenced.

#### 4.6 ADDITIONAL CONSIDERATIONS

The Boggomoss Snail on Mt Rose Station occurs in a highly altered landscape. The black soil alluvial floodplains of the Dawson between Taroom and Theodore have been highly modified for farming. Hence, there remains the question of what was the original habitat of the Boggomoss Snail?

According to the CSIRO land system maps the Mt Rose alluvial flats were largely 'brigalow country on alluvium associated with the Dawson River'. The soils were depositional alluvium on deep cracking clays with gilgai formations. The vegetation was brigalow with some shrub understorey and associated grassland (Speck *et al.* 1968).

It would therefore appear that these gilgaied brigalow habitats formed the historical core area of Boggomoss Snail distribution. This theory also has support from another source.

A sister species of the Boggomoss Snail (*Adclarkia* sp. 'Chinchilla' to be described by the author in an up-coming publication) lives in gilgaied brigalow habitats surviving in road verges in the Brigalow-Chinchilla area. This

is a very similar looking snail with a very similar shell to the Boggomoss Snail.



#### Road verge near Brigalow village

The closed canopy of these brigalow communities, the associated deep accumulated litter and timber on the ground provide the necessary microhabitat for the survival of the snail. The gilgais help maintain a relatively stable moist environment because of their ability to retain moisture for extended periods after rainfall.



#### Microhabitat in road verge near Brigalow

All of the above have significant implications for the selection of sites suitable for the conduct of translocation trials.

## 5.0 TRANSLOCATION TRIAL CONSIDERATIONS

In the absence of any additional Boggomoss Snail populations, and in the context of its current tenuous existence, it would seem imperative that attempts be made to establish additional populations of the species irrespective of the potential impact of the proposed dam. This accords with a recommendation of the Recovery Plan for the species (Stanisic 2008). The potential construction of the Nathan Dam provides an added imperative and opportunity via funding from the proponent to investigate such establishment.

A prerequisite to translocation is the conduct of successful translocation trials.

Fundamental to this issue is the availability of suitable sites for the conduct of trials and the availability of a source population of sufficient numbers from which to select individuals for the trials.

### 5.1 POSSIBLE TRANSLOCATION TRIAL SITES

From the information gathered in this survey, three broad habitats that can be utilised for the trials present themselves:

- Riparian
- Brigalow; and
- Boggomoss

Riparian. Suitable riparian habitat is sparse between Taroom and Theodore due to land clearing and flood impacts.

The riparian habitat represented by the Isla-Delusion area is the most extensive and includes a variety of flood immunity levels. It has evidenced survival of the snail for at least 12 years but should not be regarded as optimal habitat for the species. However, the fact that it has been able to support a breeding population makes it suitable for translocation trials if not for actual translocation.

Brigalow communities. The gilgaied brigalow habitat that once existed on the alluvial flats of the Dawson, formed part, and possibly

formed the core of the Boggomoss Snail distribution. However, this has largely been cleared but besides small remnant areas, corridors of brigalow regrowth exist on alluvium in the Taroom area. These are similar in structure to those inhabited by a sister species at Chinchilla. Examples from Boggomoss Station that are outside the proposed inundation area of the Nathan Dam are shown in the accompanying photographs. These are also considered suitable for the conduct of snail translocation trials provided measures are taken to exclude stock. There may also be other such habitats outside the inundation zone in the Taroom area which are yet to be identified.



**Brigalow on Boggomoss Station**

**Boggomosses.** A total of 23 boggomosses were investigated during the current or previous surveys. Only those which support substantial tree, hence litter, development are potentially suitable as translocation sites. No such sites currently exist though a number could be rehabilitated to potentially provide suitable habitat.

The Mt Rose boggomoss harbouring the main mass of the Boggomoss Snail distribution would be used as a control site to see whether the mechanics of translocation have any bearing on the outcomes of the trials. Handling and even short-distance removal of snails from their microhabitats may be important complicating factors affecting the outcome of the trials.

## 5.2 SOURCE POPULATION

Revised estimates of the main Mt Rose population of the Boggomoss Snail indicate that it is the most robust population of the snail from which a limited number of individuals (of different size classes) can be taken for the conduct of the trials without threatening the integrity of the population at the site.

## 5.3 TRANSLOCATION PROTOCOLS

Currently there are no formal protocols for the translocation of invertebrates in Australia. However, general guidelines have been developed in New Zealand that also include some which are specific to snail translocation. These have application in the present case and a formal proposal for the conduct of translocation trials of the Boggomoss Snails needs to embrace these.

## 6.0 CONCLUSIONS

- Two new boggomoss populations of the Boggomoss Snail were discovered on Mt Rose Station and the range of the Isla-Delusion population was extended to include additional upstream riparian habitat;
- The main Mt Rose boggomoss population of the Boggomoss Snail is now

considered the stronghold of the species. Earlier estimates of the population (< 100 individuals) have been revised to >350 individuals.

- The riparian population of the Boggomoss Snail along the Dawson River at the Isla-Delusion camping and water reserve is considered to be a patchily distributed but viable population. Too few individuals were recovered from here to enable a re-estimation of population size.
- The results confirm the preferred habitat of the Boggomoss Snail as the alluvial flats (floodplains) of the Dawson River between Taroom and Theodore. Historical records indicate that gilgaid brigalow communities inhabited black soil alluvium along the Dawson and probably formed the core area of distribution. This is supported by the habitat preference of its sister species.
- The preferred microhabitat of the species appears to be deep, moist, accumulated litter. Under fallen timber is also a source of living space for the species.
- Three sites have been suggested for the conduct of translocation trials. These comprise test sites in riparian and brigalow habitat and a control location in existing boggomoss habitat.
- The Mt Rose boggomoss population is regarded as robust source population from which snails can be taken for the translocation trials without threatening the existing population..

## 7.0 REFERENCES

- Ingram, G.J. & Staniscic, J. (1997).** *Dawson River Project. Impact assessment study: Boggomosses (mound springs) and other spring-fed areas.* Queensland Museum: Brisbane.
- Speck, N.H, Wright, R.L., Sweeney, F.C., Perry R.A., Fitzpatrick, E.A., Nix, H.A., Gunn, R.H. and Wilson, I.B. (1968).** *Lands of the Dawson-Fitzroy area.* Queensland. Land Research Series No. 21. CSIRO, Melbourne.
- Staniscic, J. (1996).** *New snails from boggomoss environments in the Dawson Valley, southeastern Queensland (Eupulmonata: Charopidae and Camaenidae).* *Memoirs of the Queensland Museum* 39: 343-354.
- Staniscic, J. (2008).** *Recovery plan for the boggomoss snail Adclarkia dawsonensis.* Report to Department of Environment, Water, Heritage and the Arts, Canberra. Environmental Protection Agency: Brisbane.