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Gap Creek Valley and boulder caves within the Watagans National Park

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Abstract

The upper reaches of the Gap Creek valley are located in the Watagan Mountains, which form part of the Great Dividing Range to the west of Newcastle. The mountains in this vicinity are typically characterised by flat ridgelines, numerous sandstone cliffs, steep slopes and deeply fissured gullies. The steeply sloping valleys are eroded from sandstone and conglomerate bedrock. In many places 30 to 50 metre cliffs tower above, while other parts of the valleys have steep scree slopes covered in dense rain forest. Large boulders which have broken free of the cliffs over millennia, have tumbled down the slopes and lay scattered amongst the forest, with greater numbers found in the Gap Creek perennial tributary gullies.

A network of small caves have been created by the voids between the many boulders in the gullies and provide a habitat for a wide variety of fauna. Two of the larger caves have been surveyed and are described in detail. A literature search failed to locate any published material identifying the existence of boulder caves in the Gap Creek valley.

The protected valley contains three distinct forest types, which supports a wide variety of vegetation, including many tall tree species. Much of the valley's post colonial history is centred around the timber industry which thrived for more than a century in the area, before becoming part of the Watagans National Park.

Introduction

This paper discusses the geology, vegetation and history of the Gap Creek catchment within the Watagans National Park and details two boulder caves within this area. While the caves are relatively small compared to other know caves of this type around Australia, the Gap Creek caves are an important habitat for the variety of fauna which rely on the micro climate found within the caves beneath the rainforest canopy. This paper is the culmination of many years of exploration in the valley, searching for and documenting the caves and fauna they contain.

Geographic and geologic settings

The upper reaches of Gap Creek within the Watagans National Park, is 5 km north of Martinsville and 31 km West of Newcastle NSW, at an elevation >220 metres ASL. The valley can be accessed from Mount Faulk and Bangalow Roads, which enter the National Park from the South-East (Figure 1).

The Watagan Mountains make up a small portion of the Great Dividing Range, which stretches for more than 3,500 kilometres down the length of Australia's east coast. The exposed sandstone and conglomerate rocks, which make up the cliffs in the Watagan's Gap Creek area, were originally laid down as part of the Sydney Basin strata.

"Generally speaking the sedimentary history of the Sydney Basin is the result of a marine transgression at the end of the Late Palaeozoic glaciation, followed by a marine regression during the Late Permian and Triassic times. Major sedimentation ceased about the middle of the Triassic period" (Branagan and others 1976. p.2).

Subsequent tectonic events lifted the strata to form the Great Dividing Range about 50 million years ago. "More recently, volcanic flows covered large areas of the mountains in basalt. These have largely worn away, leaving only occasional outcrops on the high peaks" (Wikipedia 2018).

The Watagan Mountains consist of thickly bedded sandstone with lenses of conglomerate, dominated by the Hawkesbury and Narrabeen Group sandstones common within the Sydney Sedimentary Basin (Stone and others 2008). These Triassic sedimentary rocks formed between 208–245 million years ago (H-CRCMA 2009. p.4).

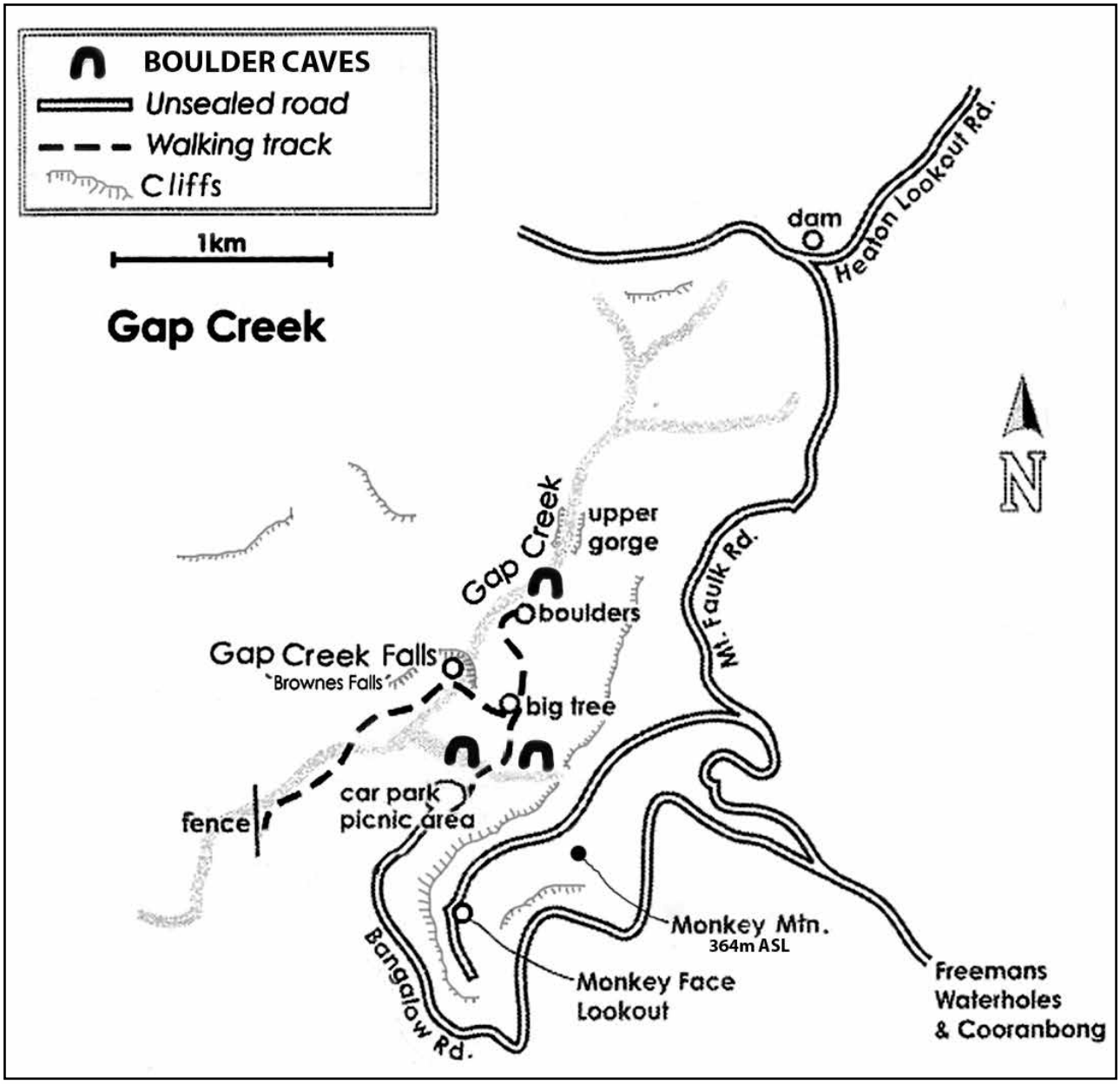

Figure 1. Location of caves within Gap Creek Valley.

Erosion over millions of years has created the present topography of the Watagan Mountains, which is characterised by flat ridgelines, numerous sandstone cliffs, steep slopes and deeply fissured gullies. The soils are generally acidic sandy loams with low to moderate fertility, and are highly erodible (Murphy 1993).

About 1 km to the south-west of the caves, is the National Park boundary and an abrupt end of the rainforest. A fence line marks the transition to private pastoral properties now cleared of the native vegetation.

The caves

Over millennia many large chunks of the conglomerate and sandstone cliffs have broken away and the boulders rolled down the slopes to collect in the gullies (Figure 2). The caves are created by these large boulders resting in the perennial stream gully near the end of Bangalow Road. The largest of these boulders is approximately the size of a double-decker bus. The voids between the boulders have formed a network of small caves (Figure 3).

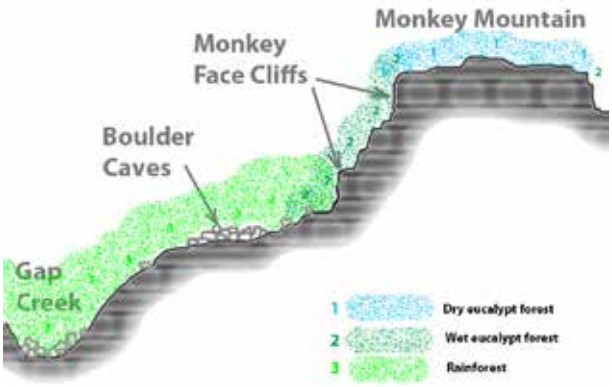

Figure 2. Section through Gap Creek and Monkey Mountain, showing location of caves and typical vegetation cover.

Figure 3. Cave created by boulders in a perennial creek bed. Photo G.K. Smith

Many of the boulders contain substantial eroded concave surfaces, which are consistent with the type of wind and moisture weathering caves occurring in nearby cliff faces (Figure 4). A number of the boulders containing significant weathered concave surfaces have come to rest with the concave surface facing down, so as to form a chamber beneath the boulder. There are examples in the two caves described as well as under stand-alone boulders scattered among the rainforest.

Figure 4. Cave under a large boulder which was originally a weathered cliff cave before breaking free of the escarpment and tumbling down into the gully. Photo G.K. Smith

The two largest known caves in the area are located in a tributary gully of Gap Creek near the end of Bangalow Road. They are the Bangalow Rock Pile Cave (I6E-68) (Figure 5) and the Log Jam Cave (I6E-69) (Figure 6). Both of these caves and several others located on Gap Creek above the falls, are at an elevation of ~260m ASL (Figure 1).

Several small streams flow beneath the boulders and through the caves. The streams are normally fed by seepage water from surrounding soils, however during periods of heavy rainfall, surface runoff from the cliffs above can turn the normal trickling stream into a fast moving flow. During extreme periods of drought, a number of small permanent pools in the caves, maintain a high humidity atmosphere within them all year round.

Bangalow Rock Pile Cave (I6E-68)

This cave is the most significant of the two caves described in this paper (Figure 7). There are four known entrances and a total survey length of 60m. It consists of several chambers connected by low crawl-ways along a perennial streambed. In many places throughout the cave, the boulders are resting on exposed bedrock, washed clean by turbulent water flow during times of flood (Figure 8).

Figure 7. Boulders in gully which have created part of Bangalow Rock Pile Cave (I6E-68). Photo G.K. Smith

Figure 8. Inside Bangalow Rock Pile Cave (I6E-68). Photo G.K. Smith

Several small chambers branch off the main passages at different levels. The upper levels are generally dry and frequented by bats while the lower levels are very damp and favoured by Glow-Worms.

Entrance No.4 is the most obvious entry point, however this is the most difficult entrance due to the 3.5m vertical drop and smooth boulder surfaces.

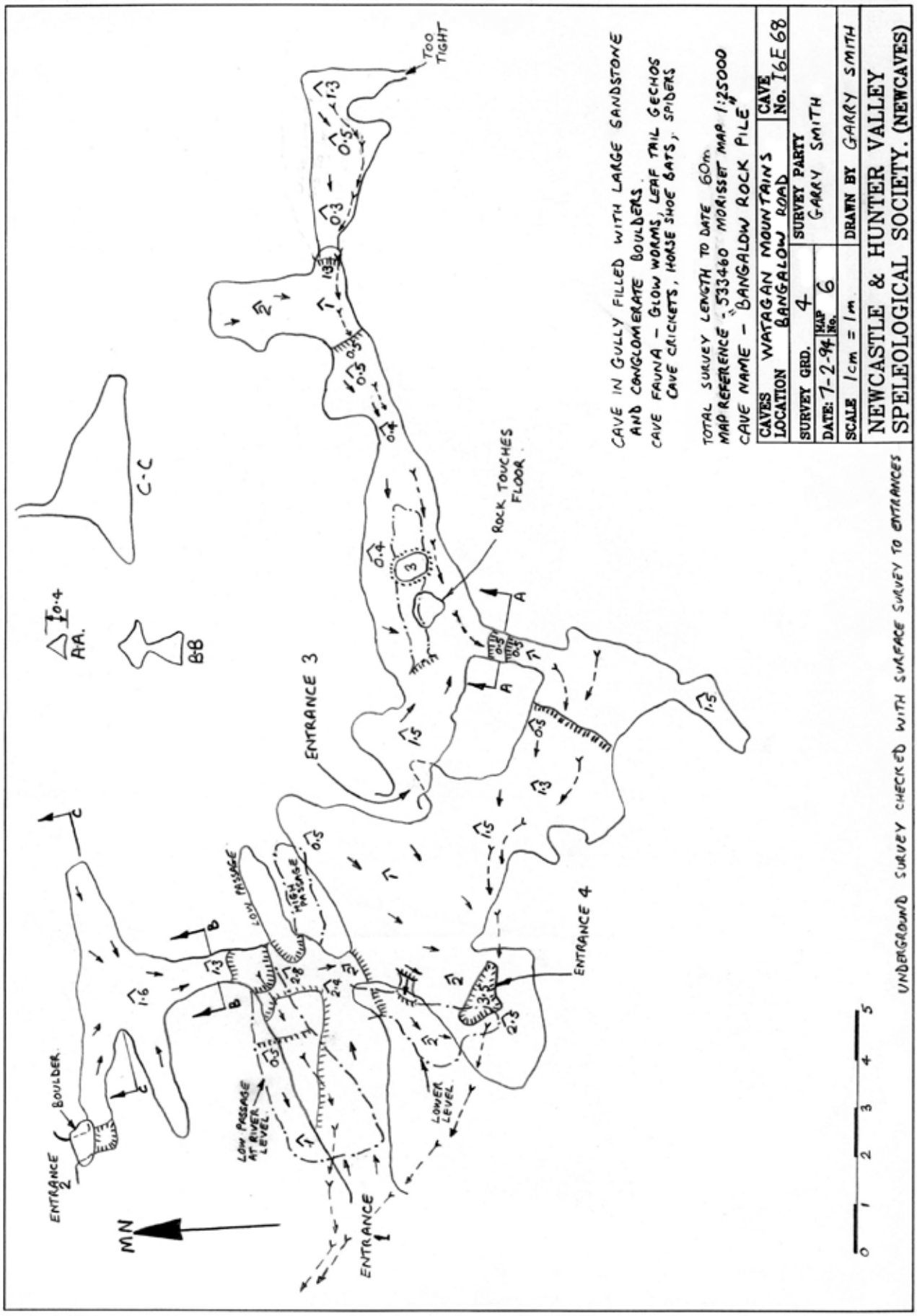

Figure 5. Bangalow Rock Pile Cave (I6E-68)

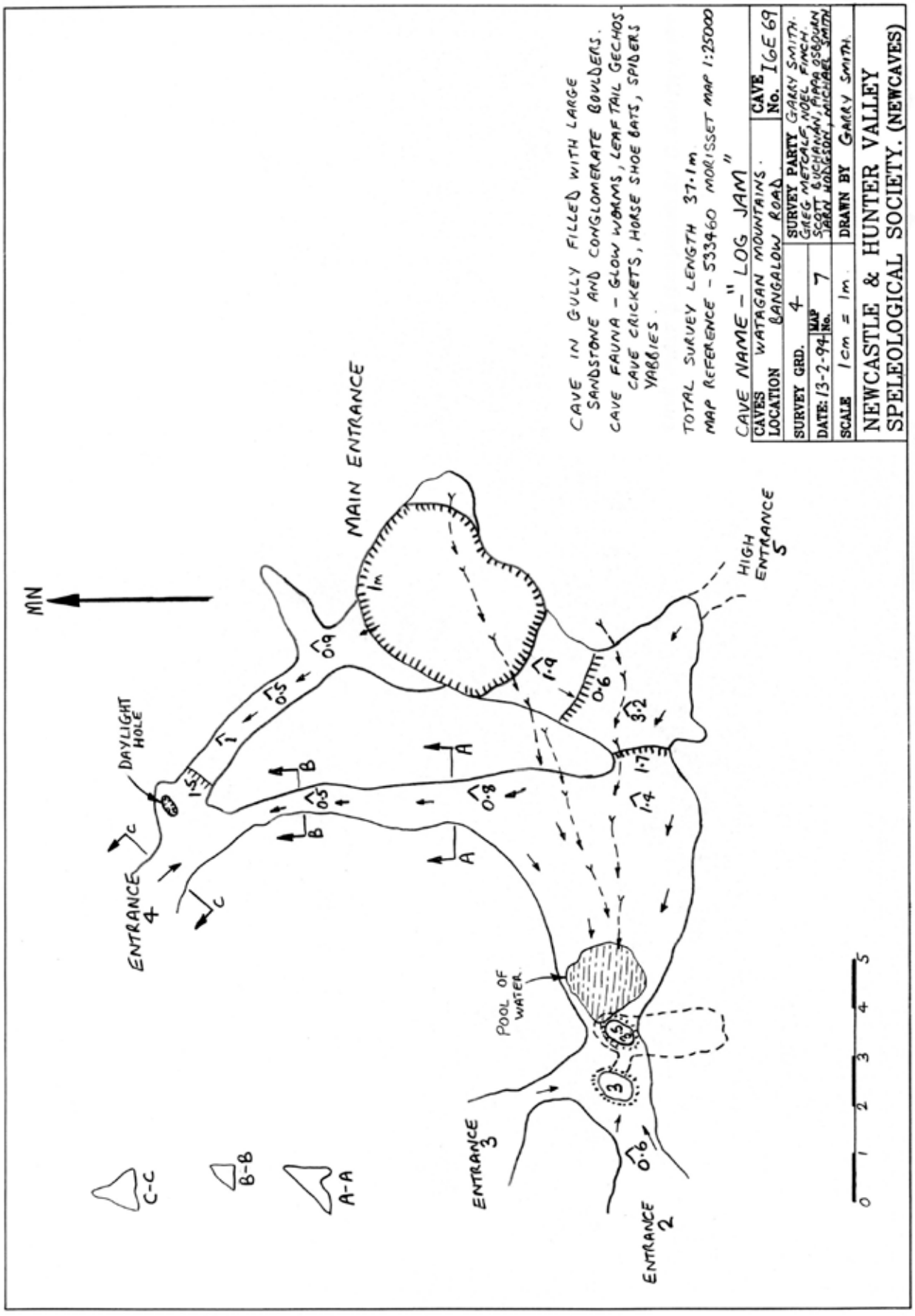

Figure 6. Log Jam Cave (I6E-69)

Gap Creek boulder caves

This entrance is directly above one of the larger chambers in the cave and allows some light to enter this chamber, however direct sunlight rarely penetrates the high forest canopy.

Log Jam Cave (I6E-69)

This cave has five known entrances and a total survey length of 37m. The main entrance is quite spacious and easy to access. There is a large section of exposed bedrock leading from the main entrance down to a pool, two metre diameter. From here several crawl-way passages with mud floors, can be followed to other entrances (Figure 9). After floods the crawl-ways may be full of forest debris, however this can easily be removed. Leaches have often been encountered near the cave entrances.

Figure 9. Cavers exiting via No.4 entrance of Log Jam Cave (I6E-69). Photo by G.K. Smith

No bats have been observed in this cave despite there being a couple of avens up to 3.5 metres in height.

Fauna in caves

Due to perennial streams and a number of permanent underground pools located in the cave's dark and twilight zones, a diverse range of water dependent fauna can be found below ground. These include: leeches, freshwater snails, fishing spider (*Dolomedes sp*.) freshwater shrimp, yabbies, tadpoles, diving beetles and mosquito larvae to name a few. The caves also supports a healthy population of glowworms *(Arachnocampa richardsae)*, Leaf-tailed Gecko *(Phyllurus platurus)*, millipedes, spiders, harvestmen, weta (*Australotettix montanus)*, Granny's Cloak Moth *(Speiredonia spectans)* and numerous other species of insects (Figures 10-14).

At various times of the year, up to 20 Eastern Horseshoe Bats *(Rhinolophus megaphyllus)* have been observed in the Bangalow Rock Pile Cave (Figure 15).

Above ground there are over 150 native animals and 130 species of birds recorded within Watagans National Park, some of which are listed as endangered or vulnerable species under the *Threatened Species Conservation Act 1995*. These include the following animals; brush-tailed rock wallaby, yellow-bellied glider, koala, spotted-tailed quoll and two bat species: the large-eared pied bat and the yellow-bellied sheathtail bat (NPWS 2010, pp. 15-16).

Leeches are very prevalent throughout the forest, particularly during and after wet weather. Ticks on the other hand are commonly found in the dryer parts of the forest, in particular where there is thick low-level vegetation.

Caves discovery and visitors

No written account of the caves or their discovery was uncovered during the research for this paper, however the author has personally known of the caves since the mid-1970s and their existence was known by a few Scouting leaders at the time. The caves have been explored by groups of Venturer Scouts as part of their Initiative Course between the late 1970s through to the late 1990s.

Since 2000, the caves have been visited on several occasions by members of the Newcastle and Hunter Valley Speleological Society Inc. (NHVSS) (Figures 16, 17, 18). However, the location of the caves is not widely known by the general public, thus the number of visitors is relatively low.

The general public frequently utilise the Gap Creek rainforest walking tracks within the Watagans National Park. The cliff faces below Monkey Face are frequently utilised by rock climbers and abseilers, as there are easy access tracks from top to bottom around the exposed rock faces. NPWS has also encouraged the general public to visit the forest, waterfalls and walking trails, by providing free campsites and well equipped picnic areas in the vicinity of the attractions.

Figure 10. Granny's Cloak Moth *(Speiredonia spectans)*

Figure 11. Glowworm *(Arachnocampa richardsae)*

Figure 12. Weta *(Australotettix montanus)*

Figure 13. Huntsman spider *(Heteropoda jugulans)*

Figure 14. Leaf-tailed Gecko *(Phyllurus platurus)*

Figure 15. Eastern Horseshoe Bat *(Rhinolophus megaphyllus)* >>

[All fauna photos above were taken in the Gap Creek boulder caves by G.K. Smith.]

Figure 16. Caver negotiates a squeeze in Bangalow Rock Pile Cave. Photo by G.K. Smith

Figure 17. Looking out the entrance of a boulder cave on Gap Creek. Photo by G.K. Smith

Figure 18. The author exploring a boulder cave at Gap Creek. Photo G.K. Smith

Flora of the valley

There is a wide variety of vegetation, ranging from rainforest in the gullies through to 'Moist Eucalypt Forests' and 'Dry Forests' on top of the ridges (Figure 2). The transition between the vegetation types can be very abrupt and occur due to cliff lines, valleys, soil composition and depth, and micro climate created by the topography. All three general vegetation types in the area, occur within a several hundred metre radius of the caves.

The vegetation at Gap Creek can be categorised into three broad forest types. However as there are a vast number of plant species which comprise the forest types, it would be impractical to include a complete list in this paper.

Rainforest

Smaller areas of warm-temperate sub-tropical rainforest and paperbark palm forests occur in sheltered gullies and creek-lines (Figures 19 & 20). Typical rainforest species include lilly pilly (*Acmena smithii),* sassafras (*Doryphora sassafras*), brush cherry (*Syzygium australe*), wild quince (*Guioa semiglauca*), coachwood (*Ceratopetalum apetalum*) with tree ferns (*Cyathea australis, C. leichhardtiana, C. cooperi*), climbing vines and epiphytes common beneath the canopy. Isolated stands of red cedar (*Toona ciliata*) and Illawarra flame trees (*Brachychiton acerifolius*) remain in more remote areas (NPWS 2010, pp.11-12).

Figure 19. Rainforest vegetation in Gap Creek.
Photo by G.K. Smith

Figure 20. Strangler Fig and vines growing over a boulder in the Gap Creek rainforest.
Photo by G.K. Smith

The paperbark palm forests contain a number of melaleuca species (*Melaleuca biconvexa* and *M. linariifolias*) with white bottlebrush *callistemon salignus*) and cabbage tree palms (*Livistona australis*) (NPWS 2010, pp. 11-12).

Moist eucalypt forests

Watagans National Park and adjacent Jilliby State Conservation Area contain similar vegetation types. Tall moist eucalypt forests are widespread in the reserves and predominately occur on the higher slopes below the ridge line down to the fringes of the rainforest. They commonly contain turpentine (*Syncarpia glomulifera*), mountain blue gum (*Eucalyptus deanei),* white mahogany (*E. acmenoides*), Sydney blue gum (*E. saligna*), blue-leaved stringybark (*E. agglomerata*), blackbutt (*E. pilularis*) and grey gum (*E. propinqua*) with warm temperate rainforest influences dominating the understorey of these communities (NPWS 2010, pp. 11-12).

Dry forests

This forest type is found predominately on the ridge top where soil depth is shallow. Forest oak (*Allocasuarina torulosa*), Sydney peppermint (*E. piperita*), broad-leaved white mahogany (*E. umbra*), large fruited red mahogany (*E. scias subsp. scias*), smooth-barked apple (*Angophora costata*) and red bloodwood (*Corymbia gummifera*) are common in the drier forest areas with understoreys varying from open dry and grassy, to dense shrubbery (NPWS 2010. pp.11-12).

Land surrounding the National Park is used predominantly for forestry, with grazing and smaller

rural residential hobby farm lots in the foothills and valleys below (NPWS 2010. p.1).

History of the area

The original inhabitants of the Watagan Mountains are the Awabakal and Darkinjung Aboriginal peoples. Evidence of their occupation can be found throughout the area in the form of occupation and art sites, engravings and axe grinding grooves (NPWS 2010 pp. 18-19). Watagan is an Aboriginal word meaning "many ridges" (Ray 1993).

European use of the area began in the early 1820s, with the arrival of the cedar getters. Hardwood harvesting followed, bolstered by demand during the construction of the nearby Newcastle - Maitland rail link in the 1850s. A timber supply route to the coast via Dora Creek helped to keep up with the timber needs of the growing coal mining industries. During the 1970s and 1980s, local saw-millers received substantial contracts to supply sleepers for the construction of the rail line between Newcastle and Sydney (NPWS 2010, p.21-22).

Timber was the backbone of the local economy and four large steam-driven timber mills were operating in the area in the 1870s (Anon. 2009). Cedar trees grew in abundance throughout the Watagan Mountains and it was a very sort after timber for furniture. The early (colonial cedar) trade saw most of the cedar shipped off to England to supply an insatiable market for fine softwoods. (NPWS, 2010. pp. 21-22).

The early roads in the mountains were developed from the original bullock tracks used to extract logs. Timber production from the mountains was increased through the construction of tramways, loading points and elaborate mechanical flying foxes to lift or drag logs to the sawmills (NPWS 2010).

The demand for railway sleepers generated by the construction of the Sydney-Newcastle railway caused a boom up till its completion in the late 1880's.

In 1916 the creation of the Forestry Commission (now Forests NSW) saw much of the Watagan Mountains set aside as State Forest (NPWS 2010). By 1936 the Forestry Dept had resumed all the land and declared the whole of the Watagan Mountains as a forest reserve for the growth of timber (NPWS 2010, p. 22).

At this time, the newly created Olney State Forest encompassed 44,000 hectares and included the area where the caves are located. Large plantations of Blue-leafed Stringy Bark and Blackbutt were planted in parts of the forest during the 1960s and 70s, to supplement selected timbers (NPWS 2010).

During World War II the forests were almost entirely stripped of their softwoods, particularly coachwood, which was used for the Diggers' .303 rifle and for the construction of the Mosquito fighter plane (Anon. 2009).

Monkey Mountain and Monkey Face lookout, which overlooks the Gap Creek valley containing the caves is named after Monkey, an old lead bullock from the timber-getting days. Monkey was owned by the Browne family, who were among the early settlers, timber-getters and sawmillers in the area. There are two stories circulating about Monkey. One was that Monkey liked to hide, in its spare time, on a mountain shelf below the top of the cliff line (Anon. 2009) and the other is that it led the whole bullock team over the cliff to their death (Powell 2003). Hence the names Monkey Mountain and Monkey Face (Figure 1).

The 40 metre high Gap Creek Falls has only been known by that name since about the mid-1990s (Figure 1). Historically they were known as Brownes Falls - named after the aforesaid pioneering saw milling family in the Martinsville valley. After rain the water topples in wide sheets and veiled cascades over the falls into the broad plunge pool below. The grotto at the base of the falls is very similar to many found in the Blue Mountains.

The Watagans National Park, covering an area of 7,798 hectares, was created through the enactment of the *Forestry and National Park Estate Act 1998* on 1 January 1999, under which parts of three state forests were combined and transferred to the National Parks and Wildlife Service (NPWS 2010, p. 1). This included the Gap Creek Valley previously under the control of the NSW Forestry.

Another 47 hectares was added to the National Park in 2007 (NPWS 2010).

A draft plan of management for Watagans National Park was placed on public exhibition from 5 December 2008 to 30 March 2009. The final management plan was adopted by the Minister for Climate Change and the Environment on 10 December 2010.

Weather

The official Bureau of Meteorology records show that the Olney State Forest has a yearly temperature range between 0°C and 37°C. However, the average temperature range is between 16°C and 30°C in summer and between 5°C and 16°C in winter. The area's highest recorded rainfall is 91.4mm during one day and the average annual rainfall is approximately 1.5 m.

Due to the abrupt transition in elevation from the Eastern coastal lowlands at < 100 m, the Watagan Mountain ridges at > 400 m receive a higher than average rainfall. Nestled between the mountains, the Gap Creek valley, also receives a high average rainfall as well as the runoff from the surrounding ridges. In addition, the high mountain ridges protect the valley from severe winds, which makes it ideal for growth of high canopy rainforest vegetation. These conditions have created a relatively moist micro-climate beneath the rainforest canopy and within the caves.

Acknowledgements

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