ABSTRACT

Wilderness wild karst in Tasmania

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Many caves beneath human-modified landscapes are considered 'wild' caves because of their comparatively more difficult access and mostly un-modified cave features, which are both generally considered defining characteristics of 'wilderness'. However, such caves may be subject to hydrological (process) disturbance resulting from surface modifications, as well as high recreational pressures. This makes wild caves beneath wilderness landscapes (as widely defined) a distinctive category of caves whose lesser or negligible human disturbances of all kinds makes them more pristine examples of natural karst systems. At the same time, the lesser degree of previous karst exploration in wilderness areas make them interesting and enticing to cavers seeking new discoveries and challenging new projects in little-known regions.

Significant areas of limestone and dolomite in southwest Tasmania have substantial relief in high rainfall areas conducive to extensive cave development. Most of these areas remain little explored although some significant cave discoveries have demonstrated their caving potential. Areas such as the Weld Valley have very extensive carbonate bedrock with up to 600 metres theoretical cave depth potential but have only been explored (with some success) in a few parts. The lack of detailed geological mapping over much of the southwest — a legacy of Tasmania's environmental politics — means that the discovery of entire new karst areas remains possible and several such discoveries have occurred during the last decade. The wild nature of much of southwest Tasmania has also contributed to the survival of some unusual ecologies on karst, such as the remnant living stromatolites recently discovered on karst spring mounds in a very remote and rarely-visited south-west location. Although southwest Tasmania is a challenging environment, it is also sufficiently compact that wilderness cave exploration in the region remains within the scope of relatively light-weight expeditions.

Cave conservation issues arise regarding exploration of wilderness caves, particularly in respect of their potential to serve as pristine 'reference' examples of karst systems. However, these ethical issues have in recent times become more complex because of the likelihood that anthropogenic climate change will and indeed probably already is strongly affecting wild cave hydrology's and sedimentation processes in many regions, for example through increased flood magnitudes with increased coarse sediment transport into and through caves. This raises the still largely un-examined issue of what 'wilderness' even means in an age of global anthropogenic climate change, and how we should treat it.

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CHRIS SHARPLES

Southern Tasmanian Caverneers

Wild caves in wilderness — anything special?

Many caves beneath human-modified landscapes are considered 'wild' caves because of their comparatively more difficult access and mostly un-modified cave features, which are both generally considered defining characteristics of 'wilderness'. However, such caves may be subject to hydrological (process) disturbance resulting from surface modifications, as well as high recreational pressures. This makes wild caves beneath wilderness landscapes (as widely defined) a distinctive category of caves whose lesser or negligible human disturbances of all kinds makes them more pristine examples of natural karst systems. At the same time, the lesser degree of previous karst exploration in wilderness areas make them interesting and enticing to cavers seeking new discoveries and challenging new projects in little known regions.

The concept of wilderness (in reference to surface landscapes) is a widely challenged but arguably still meaningful concept. 'Wilderness' has been broadly defined as land entirely or dominantly un-modified by human technology. Wilderness is widely valued for a range of intrinsic benefits, ranging from ecosystem protection and resilience, recreation and health (including mental health) benefits, scenic values, experiential and inspiration values, and other non-depleting ('utility') benefits.

This concept of wilderness landscapes having value intrinsically or 'for what they are' underpinned a great deal of mid-late twentieth century environmental activism in Australia, notably the Lake Pedder and Franklin River conservation campaigns. However, in more recent decades the issue of wilderness has been challenged from several perspectives. The most discussed of these is that the indigenous pre-European human occupation of most places including Australia means there are few places globally that can truly be called wilderness; in response some have narrowed the definition of wilderness to refer to land unmodified by *recent* technology. The less discussed but most pervasive issue is that of climate change; it is rapidly becoming the case that no place on the Earth's surface will be unchanged by new weather patterns resulting from global climate change, which in turn affects vegetation, fire regimes, water, land-forming processes and fauna; this raises the question of whether wilderness is still a meaningful concept in the Anthropocene. If wilderness can no longer serve as 'benchmark' pristine environments against which to measure human change elsewhere, do they still have ecological value as environments with only indirect rather than direct human modifications? Questions such as these have barely been asked, let alone resolved.

A recent review of the wilderness concept by Hawes *et al.* (2018) argues that despite such objections, the *experience* of being in wilderness remains clearly distinctive and for some inspirational. Hence they argue that the concept of wilderness is still meaningful in some sense, even if some tweaking of definitions may be required.

This perspective suggests that whilst the ecological value of wild caves as pristine exemplars of their type has been thrown into some (unresolved) doubt by global climate change, the human experiential value of wild caves in wilderness clearly includes qualities less likely to be found in wild caves beneath modified landscapes. The greater access difficulties involved in wilderness mean that wilderness wild caves are less explored, less mapped, and thus more prone to speculation and imagination — in a word, more of a magnet for the adventurer.

Wilderness karst in Tasmania

Irrespective of issues surrounding the concept of wilderness, the extent of wilderness in Tasmania can be quantified and mapped using a methodology based on biophysical naturalness and distance from artificial disturbances which yields mapping that typically corresponds well with subjective perceptions of wilderness extent (see Hawes *et al.* (2018) for details of methodologies). Figure 1 depicts the extent of wilderness in western Tasmania as defined by this methodology.

Geological mapping across the western Tasmanian wilderness exists at good (1:25,000) scales in limited areas such as the Weld River valley but is mostly available only at very coarse scales because the Tasmanian Geological Survey has done little mapping in the region since large portions were declared national parks in the 1970s and 1980s. Figure 1 depicts the extent of known karstic bedrock in western Tasmania (excluding the Tarkine region) based on the existing geological mapping, however it is important (and interesting) to note that this mapping is known to be inaccurate or to omit karstic bedrock in some areas. For example, along the Jane and Denison rivers in SW Tasmania the writer has seen substantial areas of limestone and dolomite outcrops — some with caves — which are not depicted on the current best-scale geological maps.

Figure 1: Extent of wilderness landscapes (LHS) and known karstic bedrock (RHS) in western Tasmania (excluding the Tarkine region in the north-west). The wilderness quality map was prepared by the Tasmanian Parks and Wildlife Service (2005) using a revised version of the National Wilderness Inventory method. The distribution of karst area is based on Tasmanian Geological Survey maps at a variety of scales, as reproduced by Kiernan (1995).

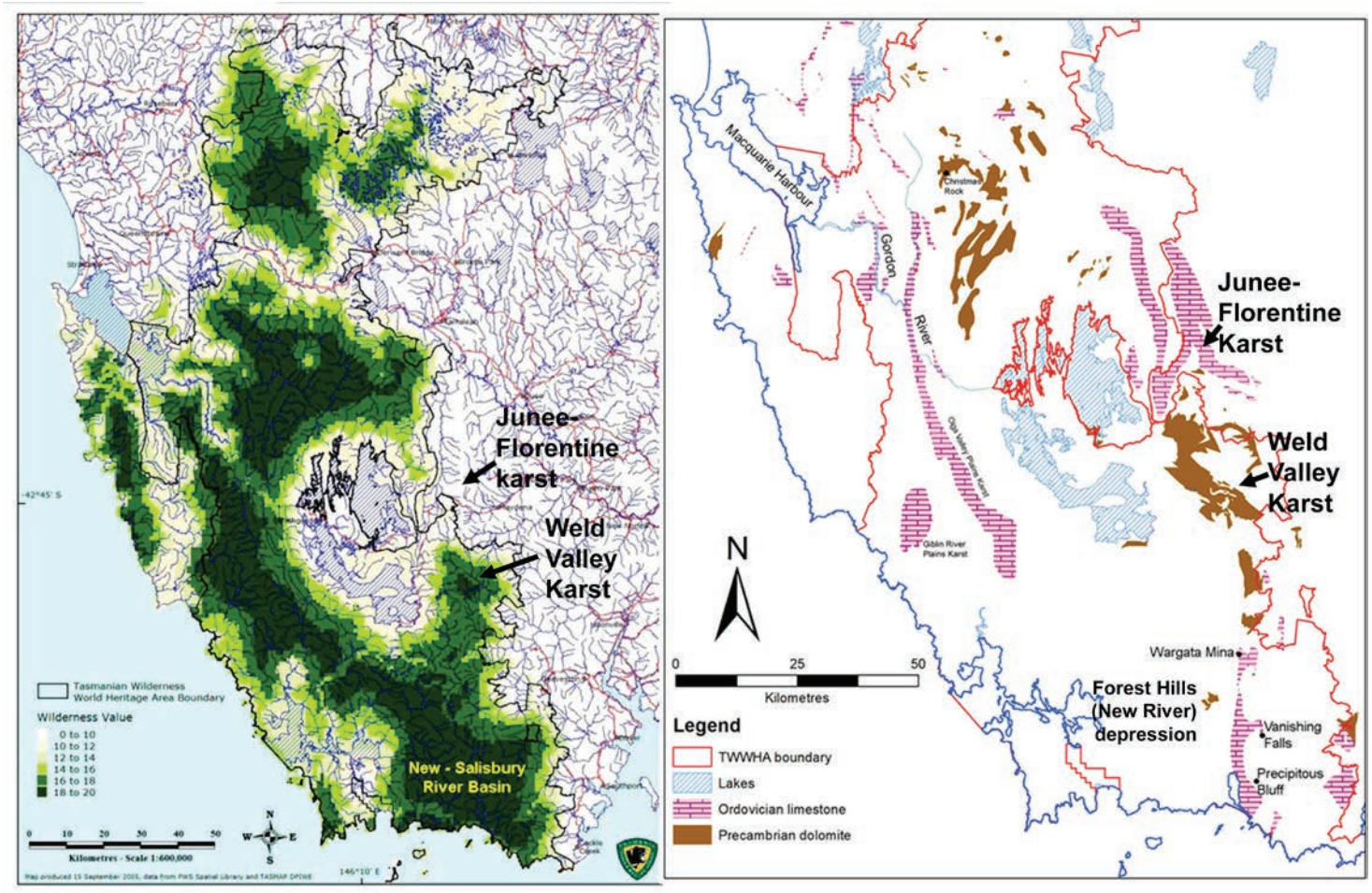


Figure 2: Christmas Rock, Lightning Plains, western Tasmania wilderness. Photo by Chris Sharples (1983).

The known karstic bedrock in western Tasmania is dominated by Ordovician-age limestones (equivalent to those forming the Junee–Florentine karst) and Precambrian-age dolomites (Mg-limestone) equivalent to the cavernous Hastings Karst. Whereas dolomite shows little cavernous development in many parts of the world, this is not the case in Tasmania where dolomite shows very extensive cavernous development in areas such as Mt Anne and the Hastings karst. Acidic soil and stream waters in western Tasmania may partly account for this unusual development.

Large areas of the known limestone and dolomite bedrock in western Tasmania forms flat poorly-drained, low-relief valley bottoms with little potential for cavernous development, such as in the Olga Valley and Vale of Rasselas. However, the western Tasmanian wilderness area also includes areas with some of the highest relief of carbonate bedrock in Tasmania, with up to 600 metres relief at the Weld Valley–Mt Anne, and around 400 m relief at areas such as Mt Picton and Mt Ronald Cross. Combined with high rainfalls in western Tasmania (up to 3000 mm per year in parts) there is considerable potential for cavernous karst development in the region. Whereas the potential for glacial sediments and cold climate slope deposits to choke and prevent cave development is present in some potentially karstic areas, this is also true of some of Tasmania's best-explored karst regions such as the Junee–Florentine and Exit Cave regions, where it constrains but has certainly not prevented extensive cave development.

Some early cave discoveries in western Tasmania's wilderness occurred during general exploration and survey trips. One of the earliest of these was an exploratory trip undertaken through western Tasmania during 1842 by Governor John Franklin and his wife Jane Franklin (not without grumbling from bureaucrats back in Hobart, since John was in fact the serving governor at the time and exploration was not seen to be amongst his vice regal duties). A large dolomite hill or hum called Christmas Rock was discovered at Lightning Plains by the track-cutters who prepared the way (and bestowed both place names). This notable feature has several arches, a stream cave and large sheltered overhangs under which the Governor's

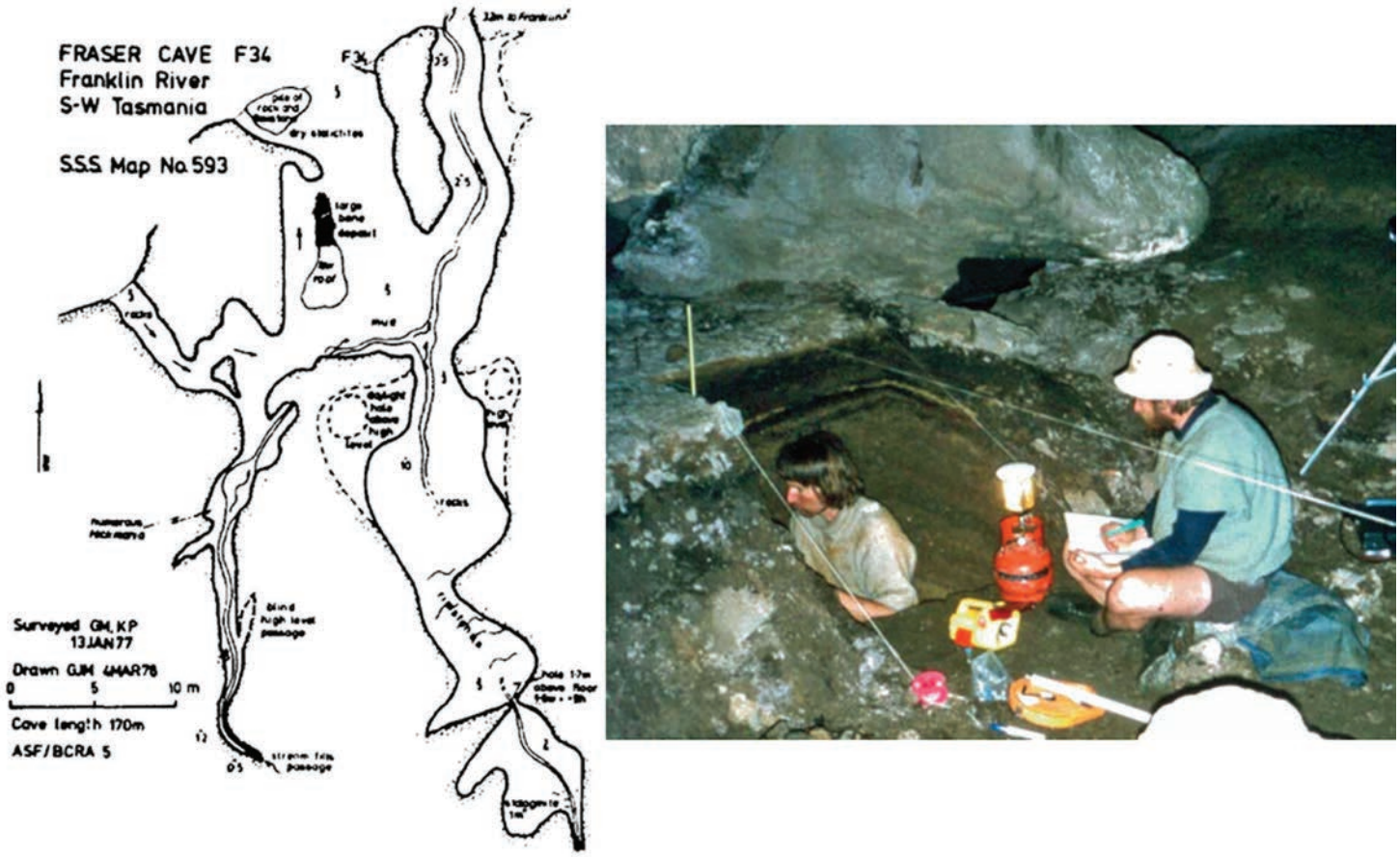


Figure 3: Kevin Kiernan and Rhys Jones excavating in Kutikina Cave (aka 'Fraser Cave') during March 1981. Photo by Greg Middleton. The discovery of Aboriginal occupation evidence in this cave was pivotal in deciding the High Court case which led to the stopping of the Lower Gordon Dam project and the protection of the Franklin River.

party camped. Despite its place in Tasmania's history, this wilderness karst feature remains little known and rarely visited to the present (but see Sharples 1999).

Probably the most intensive phases of cave exploration in the western Tasmania wilderness have been driven by conservation concerns, initially in response to a proposal for limestone quarrying in the cavernous Precipitous Bluff limestones during 1973, and then a few years later in response to plans for hydro-electric dams impounding cavernous limestone along the Gordon and Franklin rivers. In both cases the rationale was that the discovery and documentation of caves and their natural (and potentially cultural) contents could build a case for conservation of the wilderness they were situated in. Although the rationale for a quarry at Precipitous Bluff turned out to be rather shaky and unlikely to have proceeded, in the case of the Franklin River this rationale turned out to be the pivot on which the entire campaign to stop the damming of the Franklin River turned: after the incoming Hawke Labor Government declared the proposed dam illegal in 1983, the Tasmanian government High Court challenge to this legislation was only defeated by the presence of Aboriginal cultural heritage discovered in a cave on the banks of the Franklin River during 1981 by Kevin Kiernan, Bob Brown and Bob Burton (see Figure 3).

Pure adventure and the desire to explore has also motivated cave exploration in the Tasmanian wilderness, but to date has been limited to only a few obvious exploration targets relatively close to access, such as the very deep cave potentials of the Mt Anne north ridge (Weld Valley) and Mt Ronald Cross (both within a few kilometres of roads). Exploration of more remote karst areas has been very limited although one example was successful cave exploration at the very remote Vanishing Falls that was facilitated by helicopter access (Eberhard *et al.* 1991).

Forest Hills — a classic wilderness karst mystery resolved

The exploration of karst in the very remote Forest Hills karst depression (New River basin) in southwest Tasmania provides a good example of both the enticements and the pitfalls of cave exploration in wilderness. The New River catchment, between Federation Peak and Tasmania's south coast, is the largest river basin anywhere in Tasmania that has essentially no visible human disturbances such as forest clearance, tracks, roads or infrastructure, the only exception being a rough walking track and campsites near the tidal lagoon at the far downstream end of the river (Sharples 2003; see Fig. 4). The basin is one of the two largest areas of remote core wilderness in Tasmania, as measured by the National Wilderness Inventory method (see Figure 1). Right at that remote core lies a large enclosed landscape depression over 1 km wide and 60 m deep into which several large streams flow to disappear in at the deepest point. The existence of this feature had been known since the 1970s when the first 1:100,000-scale contour maps of the area were produced from air photos. However the New River basin has to this day remained rarely visited because it is one part of the Tasmanian wilderness that actually corresponds to the hype: it is in fact a very rugged (steeply incised) region cut by deep scrubby ravines and fully covered in thick-understorey rainforest (Figure 4), quite unlike the more accessible button grass moorlands that characterise much of the western Tasmanian wilderness. It really is very difficult country to access on foot!

Like many other young wilderness adventurers during the 1970s and 1980s, I had pored over maps of the south-west wilderness looking for exploration targets, and the Forest Hills depression virtually jumped off the map as a fascinating feature crying out to be explored. An enclosed depression that size with several large streams disappearing in its middle surely had to be hiding some big caves. Rumour held that only a very few people had attempted trips down the New River itself, and only one of these — a fabled trip on tractor inner tubes by Atilla Vrana and Jeanette Cox during the 1970s — was supposed to have visited the depression itself, some distance south of the river. The rumours mentioned a cave but no details seemed to be available. Drawn by the wildness of the river itself as much as by the depression, myself and Grant Dixon undertook an arduous 12-day bushwalk during 1986, in which we descended the river on a lilo and a micro-duckie. The going on the river was so

Figure 4: View south over the New River Basin and Forest Hills Depression (Photo by Chris Sharples).

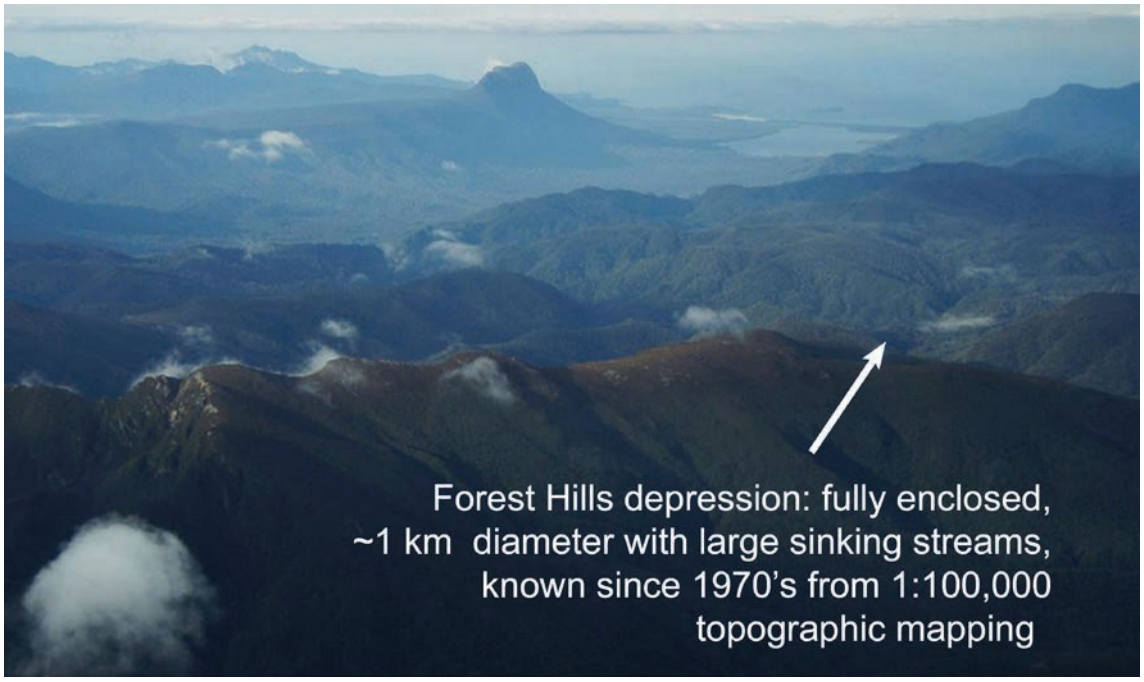


Figure 5: The only available campsite in the upper New River Gorge, *en route* to the Forest Hills karst depression in 2012. Photo by Chris Sharples.

difficult we spent four days just negotiating the main 8 km section of the gorge, and in the end did not make it to the depression itself. Nonetheless on finally reaching the mouth of the river at Prion Beach we felt like we had achieved a major bushwalking epic and were content. (I later published some purple prose about this trip in *Wild* magazine without identifying the river: see Sharples 1987.)

Years passed and while many people talked and wondered about the obvious mapped depression, I heard of few trips down the river and none into the depression. Life went on, the enthusiasms of youth faded, and I eventually shelved the idea of visiting the depression. Then in 2012 Rolan Eberhard conceived the idea of visiting the depression as part of a survey of karst in the Tasmanian Wilderness World Heritage Area (TWWHA) that he was undertaking for his employer, the Department of Primary Industries, Parks, Water and Environment (DPIPWE). The eventual exploration team comprised Rolan, Stefan Eberhard, myself and Grant Dixon, and this time we had helicopter transport to an open ridgetop north of the New River gorge. Even so, it still took us two days of hard scrub-bashing to cross the New River gorge and reach the depression. The terrain was so steep that our halfway camp was on shingles in the bed of the New River itself (see Figure 5), there being literally no riverside spots flat enough to pitch a tent on. (Fortunately it did not rain!)

We finally reached the low stream-sink point in the Forest Hills depression late on our second arduous day of scrub-bashing. There we found — as anticipated — a large 'train tunnel' cave taking all the depression drainage (see Figure 6). Disappointingly however, the big horizontal passage ended at a stream sump less than 80 metres inside the cave entrance. Indeed the high overhanging doline walls above the cave entrance were a more spectacular

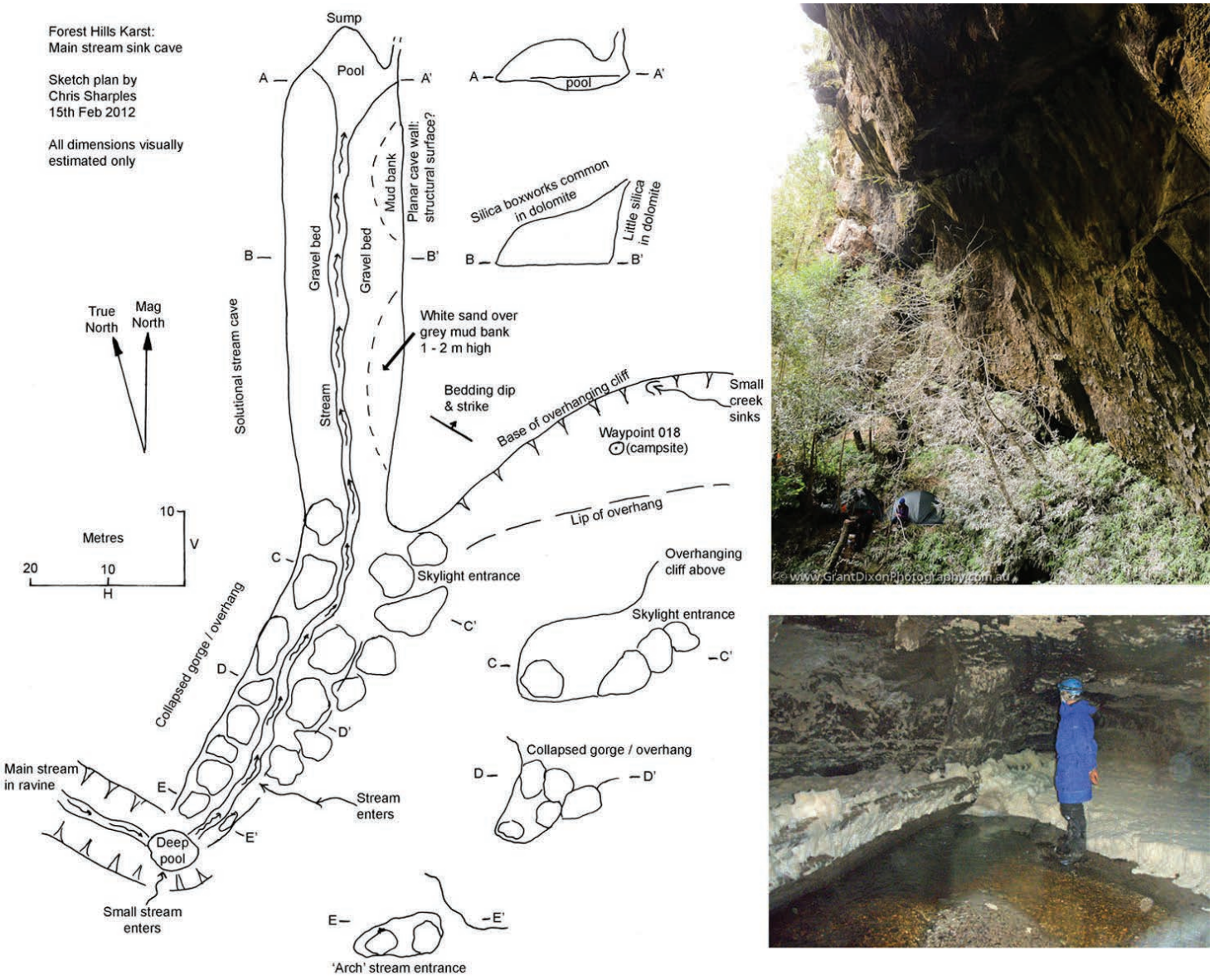


Figure 6: Plan of the streamsink cave at the bottom of the Forest Hills karst depression. Inset photos: Top — overhanging dolomite cliff adjacent streamsink cave (photo by Grant Dixon); visible white foam on vegetation indicates this area becomes a lake when inflows exceed the karst conduits' capacity. Bottom: the cave stream sump inside the streamsink cave (photo by Chris Sharples).

feature (Figure 6), and foam patches covering vegetation around and above the cave indicate that the karst water conduit is of limited size since the doline clearly turns into a deep lake when the stream discharges exceed the stream-sinks capacity. The geological mapping I undertook as part of my role on this trip indicates that despite the large size of the enclosed depression, the extent of the karstic dolomite bedrock is limited to a somewhat smaller fault block. Whilst we did not explore every corner of the depression, our results indicate that the caverneering potential of the Forest Hills Depression must, after all, be quite limited.

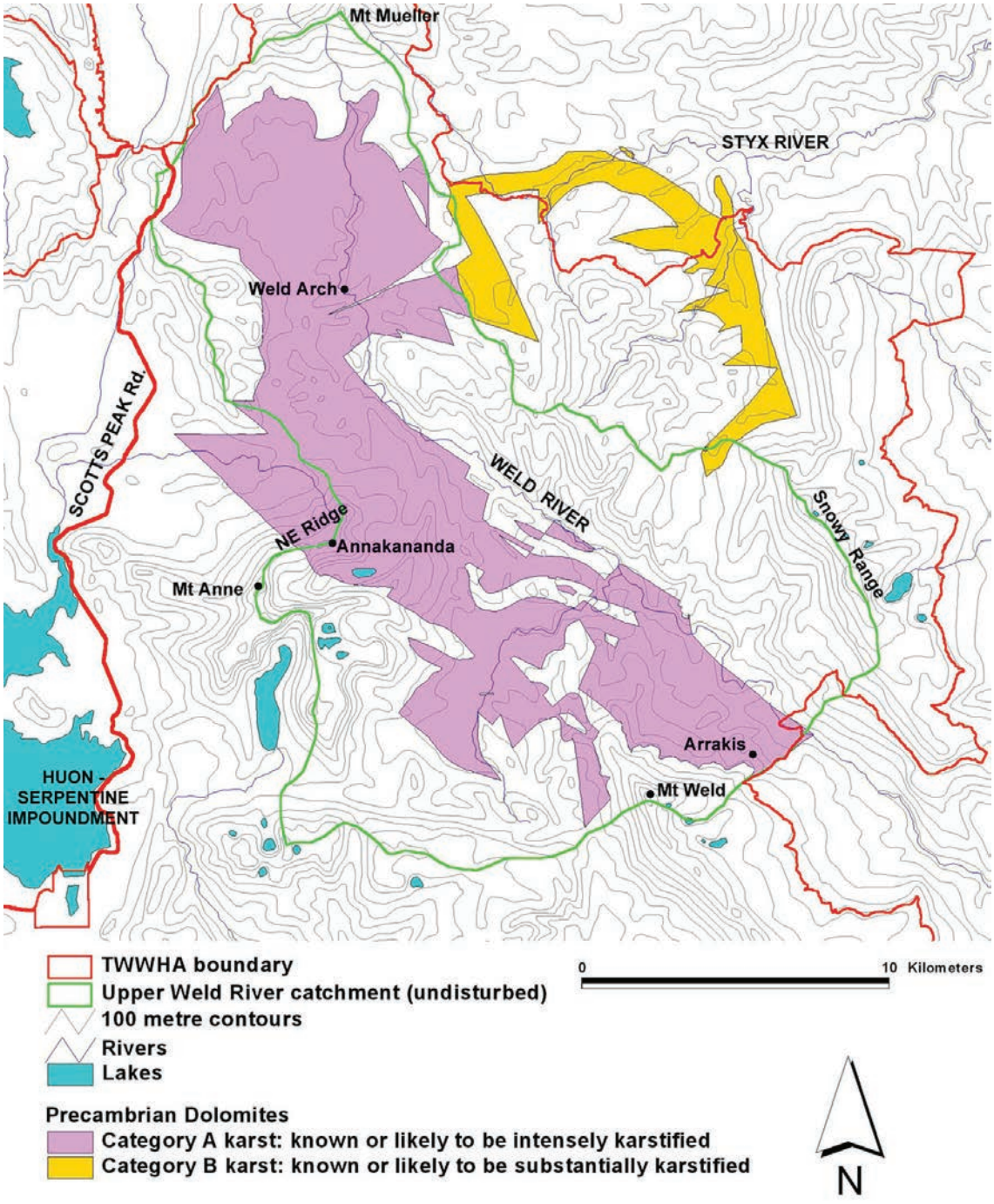
Disappointing? Yes, but also the (likely) truth, and satisfying to have determined the matter at long last. But there was one more intriguing discovery: there was essentially no naturally flat ground to camp on in the bottom of the depression, yet we found several small flat ledges obviously dug out of the soil slope and just big enough to accommodate our tents. These told us that we were not the first to visit the Forest Hills cave after all, yet we had heard or found no clear record of previous visits. It seems that not all wilderness explorers feel the need to publish their findings. This is not a bad thing.

The Weld Valley – high wilderness wild cave potential?

So where are the big promising wilderness wild cave potentials in Tasmania? If anybody were asking me, I'd say it's the Mt Anne–Weld River Valley karst. Regional-scale geological mapping was undertaken in this area prior to its inclusion in the TWWHA, so the extent of relatively pure Precambrian dolomite is known with some confidence, despite the undisturbed and mostly untracked nature of this mostly-forested wilderness area (see Figure 1).

The Weld Valley dolomites (Figure 7) cover a nearly-continuous surface area of 140 km^2, comparable to the Junee–Florentine karst, and cover a vertical range of 600 m which is

Figure 7: Geological map illustrating the extent of potentially cavernous Precambrian dolomite in the Weld River Valley, with some key known caves indicated.



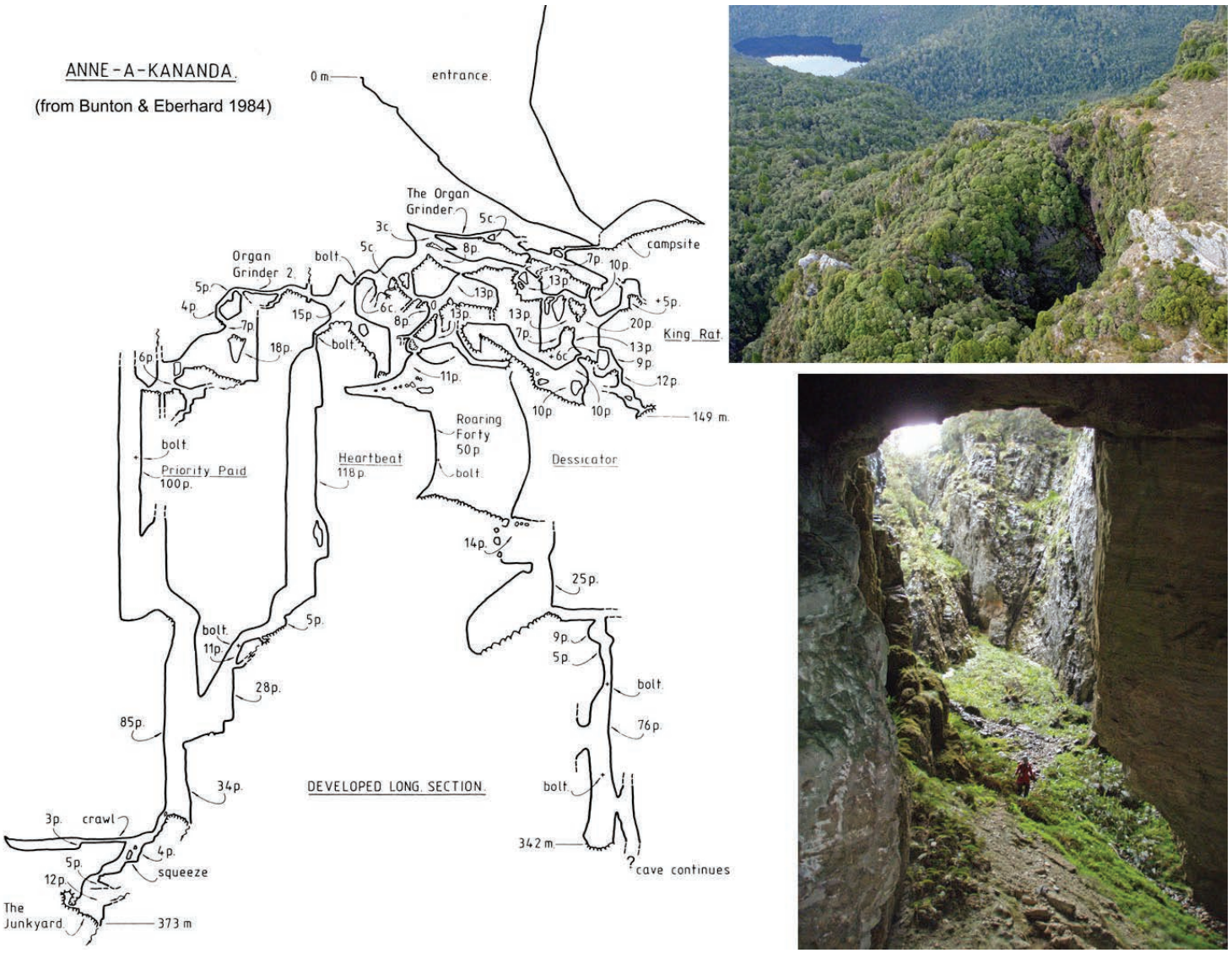


Figure 8: Anne-A-Kananda Cave, a very deep cave in the Weld Valley dolomites (at Mt Anne North-east ridge), which at one time was Tasmania's deepest known cave. Inset photos of Anne-A-Kananda entrance: upper photo by Rolan Eberhard, lower photo by Chris Sharples.

greater than the Junee–Florentine. Nearly all the dolomite occupies moderately to steeply sloping ground, with only minor low-relief valley-bottom areas, yielding the hydraulic gradients necessary for percolating groundwaters to form caves. As elsewhere in western Tasmania, glacial and slope sediments may have inhibited cave development in parts of the valley, but the existence of large known caves demonstrates that this is not a deal-breaker.

Caves of substantial scale have been explored in three relatively-accessible areas within the Weld dolomites, namely at Mt Anne North-east Ridge (accessible from Scott's Peak Road), Arrakis (accessible from nearby forestry roads via the Mt Weld track) and at the Weld River Arch where the entire river flows underground for a short distance (easily visited on rafting trips down the river). Amongst these, the north-east ridge is of note for the cave Anne-A-Kananda, which once held the record as Tasmania's deepest cave (Figure 8). Kiernan (1990) has speculated on a possible hydrological connection between Anne-A-Kananda and known springs at the lower margin of the dolomite, which if confirmed (and humanly explorable) would yield Tasmania's deepest cave at about 600 m depth. Away from the three known cavernous areas, numerous large enclosed depressions are evident on 1:25,000 contour maps and suggest widespread cavernous or at least karstic development.

There has been only very limited and sporadic exploration for caves in the Weld Valley dolomites away from the three best-explored areas at Northeast Ridge, Arrakis and Weld Arch. Uninspiring results of a handful of such trips recorded in the Southern Tasmanian Caverneers newsletter *Speleo Spiel* give a distinct impression that the area has little to offer cavers. However, it is worth reminding ourselves that exploration away from the three main areas amounts to literally a handful of exploratory attempts. It is worth asking ourselves how much karst would be known in the Junee–Florentine area is that was all the exploration that had occurred there. We would probably think that Growling Swallett and one or two other entrances was the extent of cavernous development there. Of course we now know that there is much more cave development than that, but remember how much exploration it has taken to demonstrate it!

Should we even explore wilderness wild caves?

It is sometimes suggested that knowing too much about nature can destroy its wonder, that by reducing nature to 'data' we destroy its value as a source of inspiration. This attitude was encapsulated by the poet John Keats in his line that Isaac Newton had 'destroyed the poetry of the rainbow by reducing it to a prism' and that science would 'unweave a rainbow'.

An implication of this notion is that the more we learn about nature, the less we value it; hence we should let it remain mysterious, so that we might continue to value it and be inspired by it. If we accept this, we should leave wild caves alone lest we find out so much about them that they are no longer of interest and no longer inspire us sufficiently to value their wildness.

However, I think Keats view — still widely held today — is only really held by those poets and mystics who want to believe certain nonsensical propositions about the world; they despise science because it tells them that their favourite fantasies are not true. But those poets and mystics — like Keats — almost certainly never had a scientific epiphany, they never experienced the exhilaration of finally — through observation, data and testing — understanding how some natural phenomenon really works. They only condemned science because they never understood that reality is more inspiring than fantasies and mysticism.

So, I do not see exploration of wilderness karst as being in any way undesirable; on the contrary better knowledge of wild karst yields better appreciation of its value and more capacity to protect it. However, the best protection of wilderness karst lies in its wildness; if access is difficult, damaging levels of trogging are unlikely. To protect wild wilderness caves, protect wilderness.

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