DESIGNING PLACE

AN ARCHAEOLOGY OF THE WESTERN DISTRICT

EDITED BY **LISA BYRNE, HARRIET EDQUIST, LAURENE VAUGHAN**

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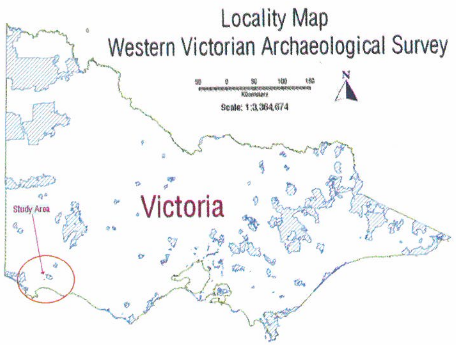
MELBOURNE BOOKS

Heather Builth

The Cultural and Environmental Landscape of the Mount Eccles Lava Flow



Map 1. Location of the Mount Eccles lava flow in south western Victoria

Australian Indigenous people are often characterised as having little or no impact on the environment or having achieved a harmonious state of equilibrium with it. Yet the established perception of a materially bereft Aboriginal family group on the move for water and other necessities is challenged by findings from archaeological research in south-western Victoria. Archaeological analysis of the weathered basalt lava flow from the Mount Eccles volcano has demonstrated that the original inhabitants, the Gunditjmara people, developed technology that manipulated prevailing ecosystems and this gave them an enhanced resource base with the means to establish resource surplus (Presland 1976; Coutts et al. 1978; Williams 1988; Builth 2002a, 2004). It is suggested that climatic change and ecological transformation inevitably directed the socio-economic and cultural development of Gunditjmara society (Builth et al. 2008). This is a landscape that demonstrates the co-evolution of humans and their environment. In this landscape, known to Gunditjmara as Budj Bim, archaeology documents the physical remains of the historical interconnectivity of the Gunditjmara with their environment. All the characteristics and attributes of the landscape are the ingredients that fed their particular social, economic and spiritual development.

LANDSCAPE DESCRIPTION AND HISTORY

The Mount Eccles lava flow, or Budj Bim (Map 2 & 3), is now one of the longest, most spectacular and, at just 30,000 years old, most recent lava flows in Victoria (Head et al. 1991). The landform, some 165 square kilometres in extent, supports wetlands and other types of water bodies. It is situated within a mosaic of Eucalyptus viminalis woodland and basalt terracing, with extensive surrounding wetlands resulting from disruption of the pre-existing drainage system. The area experiences a temperate winter rainfall regime. Climate parameter estimates derived from the predictive program BIOCLIM (Busby 1991) indicate a mean annual rainfall of 746 millimetres, with 256mm falling in the winter and 112mm in the summer; a mean annual temperature of 13°C, mean summer temperature of 17°C and mean winter temperature of 9°C.

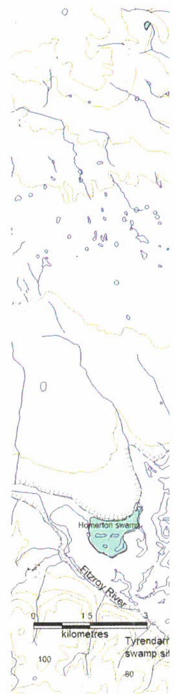
The product of highly destructive and spectacular natural processes, Mount Eccles began its existence as a fiery pyroclastic inferno spewing high into the heavens. Molten lava trailed across the land towards the ocean, blocking the ancient river routes and filling the valleys. The twisted, coiled and rearing lava flows cooled in situ and largely remained ecologically hostile to human occupation for the next 10 to 15 millennia.

A lake 20 kilometres long, now drained and known as Condah Swamp, was formed by the molten lava of the Napier and Eccles eruptions blocking the natural drainage to the ocean of a large surrounding area. The blocked waterways were to resurface as springs further down the flow at a later time. The birth of this landform had taken place in the late Pleistocene, when lands were arid, rainfall was low and water was fixed in the extended polar ice caps still awaiting the melt of the Holocene, which was to take another 15,000 to 20,000 years.

Analyses of cores from four sites across the wetlands of the Mount Eccles lava flow between 2004 and 2006 provided an understanding of the terrestrial and aquatic botanical succession across the 165 square kilometre area (Tibby et al. 2006; see Maps 2 & 3 for core sites). These analyses have contributed to our knowledge of the nexus between people and landscape (Builth et al. 2008).

THE BUDJ BIM CULTURAL LANDSCAPE

The timing of the arrival of people in Australia, although debated, is known to have occurred at least



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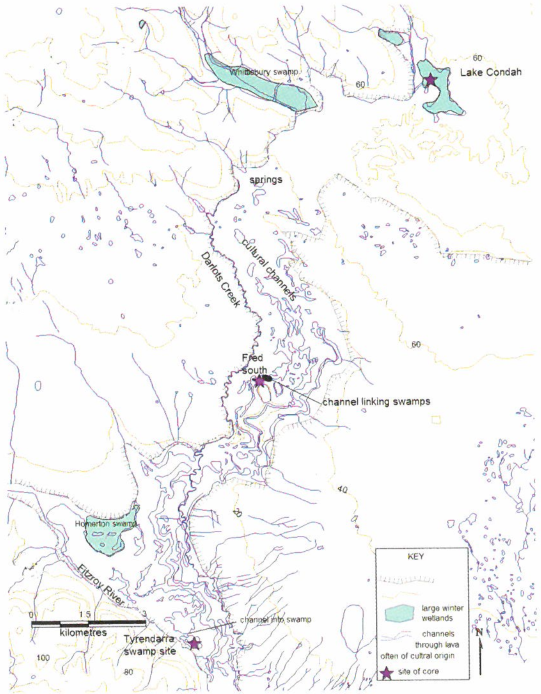
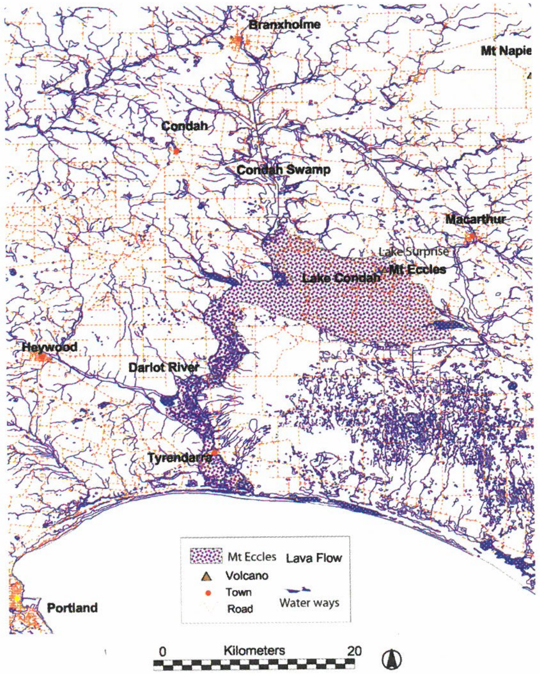




Left:
Map 2. Location of core sites Lake Condah, Fred South Swamp and Tyrendarra Swamp and features of the western arm of the Mount-Eccles lava flow or Budj Bim

Right:
Map 3. Regional waterways, lava flow and Lake Surprise core site

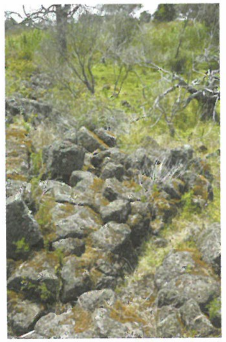
45,000 years ago (Bowler et al. 2003; Gillespie 2002; Roberts & Jones 2001) and occupation has been continuous throughout most of the continent over at least the last 35,000 years (Lourandos & David 2002; Cosgrove 1998). Consequently, people are likely to have been present in the region when Mount Eccles and the Budj Bim landscape formed. Support for this assumption is provided by oral accounts by Gunditjmara people of volcanic activity in the study area (Dawson 1881; Builth 2002a, p. 18).

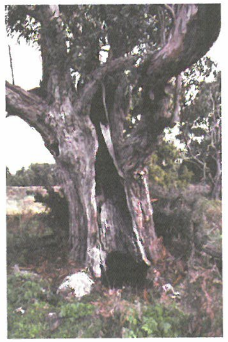
The basalt lava flows eventually became resource-rich environments integral to the evolving human–environment relationship that ultimately resulted in an extraordinary Aboriginal society. Successive generations of people lived and died here during the last eight millennia of the warmer and wetter 10,000-year-old Holocene. By recognising economic opportunities, they took advantage of the physiological features of the basalt landforms and forged a unique nexus with them.

Throughout this time Gunditjmara clans developed their social systems, internal and external relationships, economy, spiritual understanding and laws. They built their society not by passively occupying the landscape but by indelibly modifying it and so creating a dynamic eco-cultural partnership between environment and humanity.

SHORTFIN EELS AS PRIME RESOURCE

The Gunditjmara people developed their socio-economic system primarily for sustainable production and management of the highly nutritious shortfin eel (Anguilla australis). The research undertaken by Lourandos (1980, p. 387) during the 1970s demonstrated that elsewhere in southwestern Victoria a former economic expansion had taken place via environmental control and specialised technology aimed at taking maximum advantage of the ecological traits of the shortfin eel. The





Top:
Foundation of dwelling
Photo: Heather Builth, 2009

Bottom left:
Water channel remains
Photo: Heather Builth, 2009

Bottom right:
Culturally modified tree used for smoking eels
Photo: Heather Builth, 2009

eels' predictable migration patterns and habitat preference make these activities highly profitable, with low energy invested for a high return in calories, protein and fat.

GUNDITJMARA WETLAND MANAGEMENT

The Mount Eccles lava flow incorporates Lake Condah (see Maps 2 & 3), which has long been known to be associated with extensive fish trap systems and numerous stone house remains (Worsnop 1897; Coutts et al. 1978). The archaeological stone house and fish-trap remains at Lake Condah led to the claim that south-western Victoria was the locus of "complex" Aboriginal occupation within Australia (Lourandos 1976; Prescott 1976; Coutts et al. 1978; Williams 1988). However, the larger Budj Bim landform, as a cultural and socio-economic landscape, was not investigated archaeologically until the late 1990s, when field survey techniques and interpretation using GIS demonstrated that the areas where groundwater surfaces, including its entire western arm from Lake Condah south to the sea, had been subject to landscape-scale anthropogenic modification for the purpose of eel aquaculture (Builth 1996, 2002a, 2002b).

The design of the aquaculture system enabled immigrant elvers from the Pacific Ocean to reach suitable culturally manipulated wetlands in which they would thrive and grow for up to 20 years and, upon their maturity, return to the ocean to spawn. In order for the Aboriginal wetland managers to make this possible, all the wetlands on the flow were joined with both an inlet and an outlet channel, making a contiguous series of separate but integral parts that formed the whole system. Along the channels, weirs were constructed to ensure successive but sustainable trapping of eels during their outward migration (Builth 2002a, 2002b, 2004, 2006). An increased flow of water stimulates eel migration (Gooley et al. 1999), and eels are more easily trapped in flowing water than in still (Moriarty 1978). Thus a network of channels, linking marshes to the permanent swamps and constructed in order to produce a flow between them, would guarantee a seasonal high return of eels. The result is an increase in the "natural" eel biomass for the area and the infrastructure for an efficient trapping and processing enterprise.

The archaeology shows that a large investment of effort was directed towards the trapping of the seasonal migrating silver eels. This occurred at the time in their 7- to 20-year life cycle when fat and protein content was highest (Malainey et al. 1999; Leach & Davidson 2001). The systematic modification of the lava flow to produce permanently available eel habitat now ensured the long-term availability of eels in far higher numbers than would have previously occurred. The ramification of this for Gunditjmara was the necessity to catch and process the now inflated numbers of migrating eels that make their way to the ocean over a two-week period in autumn. The chronology is not yet known but Gunditjmara devised the means to process and preserve the catch. Biomolecular analysis of sediment within hollowed and culturally modified Eucalyptus ovata or viminalis trees has now confirmed that eels were preserved by smoking, (just as they have been by many other cultures around the world throughout history) (Builth 2002a). The preservation of this nutritious and valuable resource by smoking enabled the collection of the highly valued oil and provided the optimal means to facilitate their trading (Builth 2002a). The preservation and storage of a seasonally abundant, highly nutritious species combined with the perennial availability of younger eels and other wetland resources, including tubers and corms as staple vegetable foods, is considered to have resulted in sedentism and a resilient society. In addition to functioning as eel growing and trapping infrastructure, the system of channels and weirs would have worked against rainfall variability by facilitating controlled drainage in periods of heavy

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rainfall and retaining water during dry periods. The system would therefore have contributed to the stability of the population and its socio-economy.

Lourandos (1980, pp. 400–403) considers population increases and changes in social organisation to have been the motivating factor behind environmental manipulation. Following on from Lourandos (1980, 1983, 1997), researchers such as McNiven (1998), Lourandos and David (2002) and David et al. (2006) have proposed that the regional social dynamic documented by Lourandos as occurring from approximately 4000 BP to the European land invasion was socially driven. An alternative hypothesis is that the changed social dynamics are the effect and not the cause of social and cultural developments. This latter hypothesis proposes a "theoretical approach that regards past (and present) cultures as somehow functions of, or shaped by, environmental pressures" (Gaffney & van Leusen 1995). It is aimed at deciphering "the motivating factor behind environmental manipulation" and therefore the reasons for the late Holocene cultural "intensification" process as described by Lourandos (1983). Investigations on the lava flow are therefore aimed at identifying environmental change and discriminating between the human/social and/or climatic origins of these events.

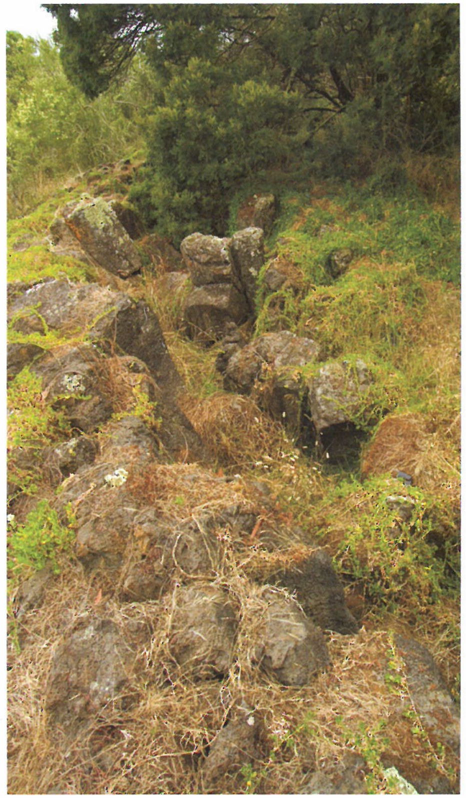
By disrupting the pre-eruption drainage patterns, the Mount Eccles lava flow would have created resource-rich aquatic environments along the flow, as evidenced by the early dates on Condah and Whittlebury swamps (Head et al. 1989). When eels contributed significantly to the Aboriginal economy is uncertain, because sea levels were much lower than today for the first 20,000 years after the eruption, providing some inhibition to colonisation by elvers from the ocean. The increased width of the continental shelf, some 50 kilometres to the continental slope, would not in itself have provided any barrier as eels in the twentieth century were abundant at sites like Lake Bolac, some 100 kilometres from the coast. In addition, the evidence following core analysis, for swamp environments as well as open water in Lake Surprise and Tyrendarra Swamp, suggests that water availability was sufficient to maintain river flow to the sea. However, the steepness of the continental slope during the lowest sea levels at the Last Glacial Maximum may have had some impact. There is also some question over climatic conditions at this time.

RESULTS AND SUMMARY OF CORE ANALYSES

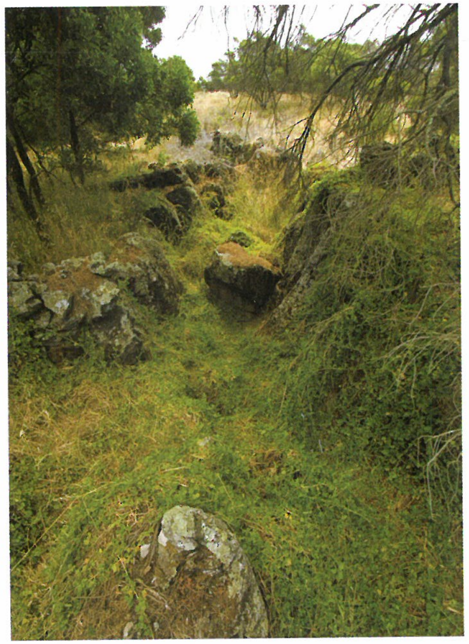
Analysis of four sediment cores from across the Mount Eccles lava flow for pollen and other types of remains – such as diatom plankton species, which inhabit aquatic scenarios and reflect salinity levels, condition and depth – provided a long-term understanding of climate and other environmental changes from when sediment began to accumulate after the lava flow was established. The cores were taken from Lake Surprise, Lake Condah, Fred Swamp South and Tyrendarra (see Maps 2 & 3 for locations).

A summary of the results (from Builth et al. 2008) shows that, although fresh water was clearly present on the lava flow from shortly after the time of its formation, this landscape may have been unsuitable for occupation for many thousands of years. The evidence indicates that, apart from a shallow, brackish Lake Surprise, wetlands were restricted to small ponds that contained only algae and submerged aquatics, and with the basalt surfaces largely devoid of vegetation. However, it is likely that a variety of aquatic resources, although limited in their distribution, were available for exploitation by people. There is little evidence of similar developments in dryland vegetation at this time.

The palaeoecological records from the glacial-Holocene transition reflect environmental variability, showing the establishment of widespread freshwater swamp and lake environments on and around the



Top and bottom:
Water channel remains
Photos: Harley Manifold, 2009



Top:
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Bottom:
Part of stone structure in forest
Photos: Harley Manifold, 2009

lava flow by at least 13,000 to 12,000 years ago, and maximum Holocene water levels and/or water flow on the lava flow by about 6000 years ago. It is likely that economically useful aquatic plants within the lava flow would have flourished within the shallow swamp environments away from the major depressions. The high level of water availability from reliable rainfall, river flow and ground water, in combination with much closer proximity to the coast as sea levels rose towards present-day levels, would have provided the ideal environment for eels and the harvesting of them.

The change from peat to organic mud at Fred South Swamp, and possibly also at Tyrendarra Swamp, is considered to have been a response to greater water flow, but it is uncertain whether this would have occurred naturally without enhancement of flow into these depressions by artificial channelling; from spring activity into Fred Swamp; and, in the case of Tyrendarra, by channelling flows south through the Tyrendarra swamps from Darlots Creek to the Fitzroy River. It is also possible that eel capture, impoundment and growth would have been facilitated by maintenance of open water that could have been assisted by the extraction of peat, which was known to be used for covering the structural framework of the stone-based dwellings (Builth 2002a, pp. 69–80), or by sediment disturbance. The presence of islands of Carex hummocks within Fred South Swamp could indicate that late successional vegetation was consciously maintained. by serving as platforms from which eels could be speared. Some support for continuous human involvement in the lava flow swamp systems may be provided by the fact that the sediment reverted to peat around the time when European settlement began, possibly a result of the abandonment of Gunditjmara eel management. A third alternative – that decomposition of the biological active surface layer could result in decomposition of the peat to organic mud in time – is thought unlikely, with a peat thickness of some 25 to 35 centimetres (Builth et al. 2008).

Of greatest interest to an assessment of human-environment relationships is the mid- to late-Holocene period. Here, there is conflicting evidence between the Lake Surprise and Lake Condah records centred on about 4000 years ago. An increase in rates of change was demonstrated in both pollen and diatom components of the Lake Surprise record from an estimated 3750 cal. yr. BP, with the diatom plankton record indicating also an overall reduction in lake level (Tibby et al. 2006). This pattern of reduced and more variable effective moisture, associated with an increase in burning, is consistent with that from the western plains generally, but also from much of eastern Australia and other parts of the globe. The variability component has been attributed predominantly to a well-documented increase in the activity of the El Niño-Southern Oscillation (ENSO) (e.g. McGlone et al. 1992; Schulmeister & Lees 1995), a feature that is demonstrated to affect this region (Drosdowsky & Williams 1991) and considered to have been initiated in the Pacific region about 5000 years ago (Turney & Hobbs 2006). A recent detailed comparison of reconstructed mid-to-late Holocene ENSO patterns and dates from archaeological sites in Queensland concluded that human activity was closely tied to ENSO activity (Turney & Hobbs 2006). Tibby et al. (2006) considered that, as the rates of change in pollen and diatoms came into phase around 3750 years ago for the first time within the Lake Surprise record, human impact could also have come into the equation. However, because the site is divorced from the eel management system, and it is difficult to conceive of a major human influence on diatoms through changes in water quality within a deep lake, ENSO was the most likely environmental trigger (Builth et al. 2008).

A different picture is presented from the Lake Condah record where water depth is considered

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to have increased around 4600 cal. yr. BP and, according to Head (1989), was to double the previous depth. She considered that the cause was a natural change in moisture availability and that only at this time did the water level allow the eel traps on the adjacent lava flow to become operational.

However, an examination of the archaeological landscape suggests a different scenario. Lake Condah shows archaeological evidence of having been modified, resulting in an enhanced capacity to hold water via the damming of its deeper south-western section. The modified section of the lake edge is situated directly adjacent to the lake's well-documented fish-trap systems. It is an accepted belief that the functioning of the traps and ponds is directly connected to the lake level – that is, as the lake level rises the adjacent ponds are filled via the channels and the spatially associated traps work to hold back water and fish can be collected then or as the level recedes. Thus, as the lake rises higher, the more distant and elevated trap systems can come into operation (Coutts et al. 1978; Head 1989; van Waarden & Simmons 1992; van Waarden & Wilson 1994; Scabe 2002).

While this is no doubt a natural consequence of rising lake levels, analysis of the hydrological regime and topography suggests a more complex relationship between the lake and the adjacent trapping systems. The infrastructure functioned as eel collection, growing and trapping systems but was designed to be fed by local catchment water from the stony rises to the south and south-west in the first instance. The trapping systems are therefore a buffer and prevent direct run-off into the lake from these directions. There are numerous sink holes to the south and south-west of the lake and it has been observed that, during rain events, these overflow through channels into the remnant ponds, unlike to the west, north and east where the local catchment feeds directly into the lake (Builth et al. 2008).

The spatial extent of the modified Lake Condah was ultimately controlled by a strategically located cultural weir at the south-western extreme of the lake. This is where the overflow during autumn and winter used to form the seasonal northern section of the Darlots Creek (Ingram 1883). Using the Geographical Information System (GIS), the position of this weir has now been demonstrated to control the levels of water in Lake Condah and even Condah Swamp (Gippel et al. 2006). It is suggested that damming of the lake and construction of the associated weir was undertaken about 4600 years ago to guarantee permanent water in the lake despite the onset of more variable climatic conditions, which feasibly dates the present Lake Condah trap systems and the initial construction of an overflow weir to this time (Builth et al. 2008).

The records give little indication of lava flow changes in the mid–late Holocene, although the high values in wetland aquatic plants such as Brassicaceae may suggest some alteration in swamp conditions. It is feasible that the water bodies along the length of the flow were dammed at this time as a technological response to the onset of climatic variability in order to maintain water levels and the continuation or enhancement of the established, aquaculture-based, socio-economic system (Builth et al. 2008).

GUNDITJMARA VERSUS EUROPEAN OCCUPATION

During the early nineteenth century, European colonisation of the region and the subsequent loss of Indigenous populations had profound effects on the environment. Indigenous populations and the British colonists shared little in the manner of cultural values of land use within the Mount Eccles lava flow environment. While the Gunditjmara invested greatly to manage and expand the wetlands, to the British colonists, pastureland was given the highest value. Consequently, the European-occupied landscape required extensive drainage and deforestation in

Top:
Remains of dwelling

Bottom:
Edge of water channel
Photos: Harley Manifold, 2009

Downstream from eel weir and trap
Photo: Harley Manifold, 2009

order to convert it to a predominance of grassland. Thus, British colonisation of the area markedly altered ongoing processes of change to the ecosystem and radically reduced the biodiversity that was characteristic of the wetlands distribution. However, the environment that the British colonists occupied was not necessarily natural or pristine. Gunditjmara had significantly expanded the wetland environment before European arrival, and consequently species composition and properties of the ecosystem were the result of interactive human and non-human evolutionary processes over the previous several millennia. Human activities have left lasting effects on the landscape, which continues to be characterised by the historically contingent interaction of all elements of the Mount Eccles ecosystems.

The British occupation and settlement via squatting rights, dating from the 1830s, caused much cultural history to be lost due to family massacres, dispersion, displacement, disease and death. Incarceration in missions and non-access to traditional country now under European ownership prevented regular cultural management and ceremony. Consequently, knowledge of former cultural activities and determining the functions of archaeological infrastructure within the now-drained landscape have largely been reconstructed from archaeological analyses, ethnographic observation and the sharing of some retained oral histories held by the direct descendants of the last recognised chief, or Wungit, of the clans of this area. (The King family were so named at Condah Mission in recognition of this status.)

Serious anthropological study was never carried out in Victoria as it was the firm belief that the fractured culture was impossible to investigate. Obviously there have been huge losses in knowledge due to this perception since anthropological studies in Australia began in the 1930s.

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THE PRESENT ECO-CULTURAL LANDSCAPE

One and a half centuries of European farming practices across south-western Victoria, with its long-established regime of draining natural wetlands in order to graze domestic livestock, have massively reduced the biodiversity of the region. One consequence has been to reduce the visibility and recognition of the previous Indigenous economic system, with its very different philosophical and practical approach – that is, contributing to the enhancement of regional ecological systems. For Gunditjmara this included the damming of wetlands in order to maximise production of the highly nutritious staple protein, the shortfin eel, and reap benefits in the form of more abundant and perennial staple aquatic plant resources.

Many of the swamps and wetlands are still drained and hold water only briefly during wet winters. Many past and even present landholders have cleared properties of the basalt rocks that once formed the foundation of an extensive Indigenous eel aquaculture system annually producing resource surplus for storage and trading.

Following recognition of Gunditjmara's past achievements through Native Title and the general awareness-raising that has occurred since Builth's PhD thesis (2002) presented the results of the Mount Eccles archaeological landscape analysis, Winda-Mara Aboriginal Corporation, through the Lake Condah Sustainable Development Project, has worked with state and federal governments to restore Lake Condah and re-establish some eel aquaculture. This is a vital part of the journey towards regaining economic autonomy on recently acquired Gunditjmara-owned lands.

The formation of the Mount Eccles lava flow, about 30,000 years ago, resulted in the development of a diverse, resource-rich landscape that from at least the end of the Last Glacial Maximum could be progressively utilised by Indigenous people. The potential for landscape exploitation was facilitated by the range of freshwater sources and associated useful plants and fauna species gradually inhabiting this landform; in particular, the abundance of shortfin eel that could be manipulated by modification of the stony rise landscape. The creation of a cultural landscape could have been gradual over a long period of time but evidence suggests that it accelerated within the last 5000 to 4000 years.

The most likely reason for the acceleration in the cultural transformation of the landscape was the onset of more variable climatic conditions over the last 4000 years associated with an intensification in ENSO activity combined with generally lower rainfall. Consequently, the sophisticated Gunditjmara society that developed from its economic base of eel aquaculture is considered to have been mainly a response to external environmental stimuli rather than being purely socially driven as the prevailing paradigm has hypothesised.

Edge of pond with weir
Photo: Harley Manifold, 2009

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