A short history of wetlands in SW Victoria:

The landscape at settlement, impact of agriculture, major wetlands near Hamilton, and wetland restoration

Rod Bird

February 2014

Publication:

A short history of wetlands in SW Victoria:
the landscape at settlement, impact of agriculture, major wetlands near Hamilton, and wetland restoration

This publication is based on an address given at a function organised by Friends of Yatmerone Wildlife Reserve at Penshurst on 1 February 2014 to celebrate World Wetlands Day. The Ramsar Convention chose Wetlands & Agriculture as the World Wetlands Day theme.

Date of Publication:
February 2014

Author:
Rod Bird (Patrick Rodney Bird, PhD. OAM), 1942-

Publisher:
PR Bird
21 Collins St
Hamilton, Vic 3300

ISBN: 978-0-9870791-7-6

Cover picture:
Bradys Swamp on the SE corner of the Grampians/Gariwerd National Park on the 16 April 2011, following an exceptional 370 mm of rain in the previous 4 months. Heifer Swamp to the east was drained in about 1900 and the water was directed via a deep channel through a lunette into Bradys Swamp. In the late 1940s a shallow drain was dug across the swamp to create a new outlet into the upper Wannon River. As a consequence of the drain, Bradys Swamp is usually dry by January or February. Works to restore this picturesque wetland are required.

All photographs are by the author except for Photo 11 which was scanned from a slide taken by Lionel Elmore in 1967.

Map illustrations are from the Department of Sustainability and Environment's FireMaps (2003).

Introduction

At settlement by Europeans the land was full of swamps and lakes – it was a soft land where '*the untroddden sward…was literally comparable to a bed of sponge; our horses sank to their fetlocks with every step...A two years occupation in most instances rendered a station so 'firm' that horse racing, kangaroo, emu and dingo hunting… formed one of the principal sources of amusement to the light-hearted settlers*' (Conley 1986).

Reports of Major Thomas Mitchell (Mitchell 1838), Stapylton (Douglas & Obrien 1971), Surveyor Tyers (1840) and George Augustus Robinson in 1840-43 (Presland 1977a, b & 1980; Clarke 1988 & 1990), provide critical evidence of how the country looked at settlement.

Schools Inspector Bonwick's book (1858) is also of use, as are the letters sent by pastoralists in the late 1840s and early 1850s to Governor Latrobe (Bride 1897).

Boldrewood R (1884), Bruni (1903) and *The Western Agriculturalist* (Anon. 1882) provide some information on the situation in the late 1800s, as does the *Hamilton Spectator* (see Anon. 1986, 1993a, 1997c), Bird (2011) and Bird, Clark and Gunn (2008).

The *Western Region Sustainable Water Strategy* (DSE 2011), the *Inquiry into Rural Drainage* (Parliament of Victoria 2013) and *Victorian Waterway Management Strategy* (DEPI 2013) document past and current status of drainage schemes and wetlands in Victoria. None have a philosophy or comprehensive plan to provide an effective and substantial program of wetland restoration. The emphasis of government has been to exploit wetlands for agriculture, and a reluctance to make changes to official drainage schemes or illegal works.

The Catchment Management Authorities that were set up in 1997 do not all manage drainage issues. This may change if recommendations from the inquiry into rural drainage (Parliament of Victoria 2013) are adopted. The *Glenelg Hopkins Regional Catchment Strategy 2013-2019* and the *Glenelg Hopkins Waterway Strategy 2014-2022* indicate that a cautious start has been made to the consideration of restoration of some drained wetlands.

We shall look first at the wetlands as they were in the early days. Then we shall consider the changes in the landscape that resulted from the development of agriculture. Finally, a brief analysis of the situation regards wetlands today, compared with that at settlement, and what we might do to improve the situation.

Explorers & settlers – harbingers of change

Major Thomas Mitchell – in the wet spring of 1836 Mitchell's party of 24 convicts, one soldier, an Aborigine from NSW and a second in command, Grenville Chetwynd Stapylton, struggled across these landscapes:

"*The land is...open and available in its present state for all purposes of civilised man. We traversed it in two directions with heavy carts, meeting no other obstruction than the softness of the rich soil; and, in returning over flowery plains and green hills fanned by the breeze of early spring, I named this region Australia Felix, the better to distinguish it from the parched deserts of the interior country...flocks might be put out upon its hills or the plough at once set to work in the plains*" (Mitchell 1838).

Assistant Surveyor Stapylton had the task of coping with this soft, exceedingly swampy country. His view of the landscape was not so lyrical for he was responsible for the extrication of bogged wagons and boat carriages and the management of unruly convicts (Douglas & O'Brien 1971).

August 16th, 1836. "*At 1 pm the Surveyor General proceeding with the light carts, gave over to me the pleasant office of seeing the bullock drivers through their difficulties. Remained with them until sunset, all bogged and bedeviled...damn the bullock drivers, bullocks, drays, wagons and all...*"

September 2nd, 1836. "*Wet weather, another infernal halt. Of all the detestable tempers I ever heard of, or could imagine, this man* [the Surveyor General?] *has the most hellish...when the Devil is hard at work within him his smile is the most sinister I ever beheld. Good Lord deliver us....*"

September 5th, 1836. "*We are cursedly hobbled with our drays....*"

September 8th, 1836. "*A vast plain with a great lake in the centre to the north east of Mt Napier...the swampy low ground...to the north is appalling...God knows how we will get through it with the drays...*"

Photo 1. **View from Mt Sturgeon across Lake Linlithgow, Lake Kennedy to Mt Napier**.

The Great Swamp (Buckleys Swamp) at the foot of Mt Napier is not visible. This was Mitchell's intended route to the Grampians but he diverted from Byaduk to the present-day Hamilton and then NE to Mt Abrupt, avoiding the swamps.

Surveyor CJ Tyers 1839

From Mt Rouse to the Grange on 7 Nov 1839 – "*resumed our journey in hopes of finding a passage between The Great Swamp (mentioned by Sir Thomas Mitchell) and Mount Napier* [Tappoc]*...having discovered we were hemmed in on all sides by swamps and stony ranges we reluctantly returned to our old encampment...the only opening appeared to be between N and NE...we skirted lake Linlithgow and avoided the swamps...encamped near Messrs. Wedge's station*" [Grange Burn].

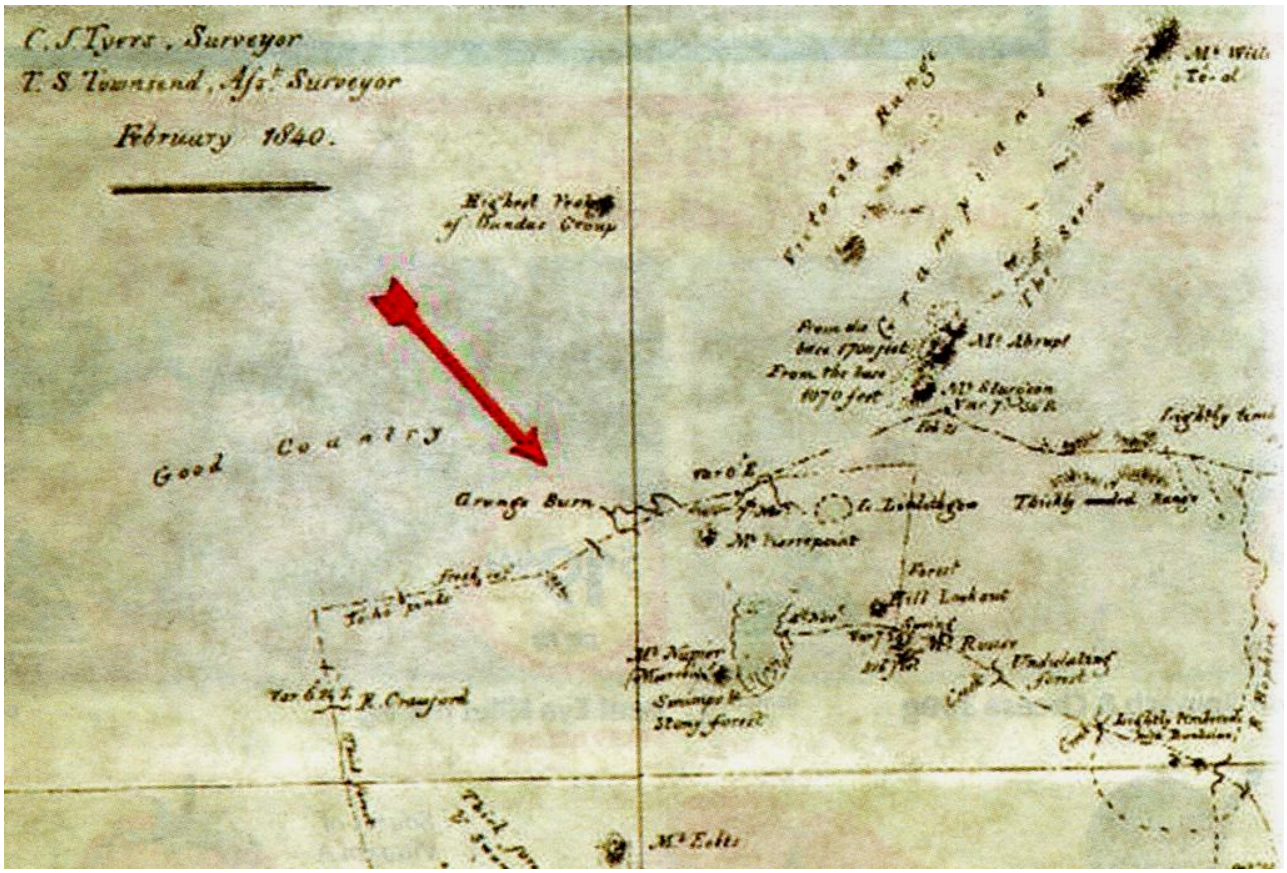
"*Between Mounts Rouse and Napier is some fine country but the greater portion consists of swamps...*"

George Augustus Robinson, May 1841

'*I rode along the swamp and on the top of the highest ground the swamp extended further than I could see and I observed many large arms or inlets branching off...in the swamp, several copses of tea-tree...the great swamp abounds in rushes, the roots of which are edible and afford the natives an ample supply...land around the swamp is elevated...and lightly timbered* (Presland 1977a).

***Photo 2* – The land from Mt Rouse, the Grampians and Grange Burn seen by Surveyor Tyers in 1840**.

Note his marking of The Great Swamp (Buckleys Swamp) east of Mt Napier and of Lake Linlithgow. His first attempt to reach the Grange Burn was aborted when he was blocked by The Great Swamp. He retreated to Mt Rouse and approached the Grange via Lake Linlithgow.



From the map (see Wallace 2013) it is easy to see why Tyers felt 'hemmed in' by swamps in 1840 when he tried to find a way through the Great Swamp to the Grange Burn. Mitchell saw that scene clearly from the top of Mt Napier and decided to avoid it. The Great Swamp occupied at least 3,000 ha of the local landscape and other swamps (including Soldiers Swamp, now drained) stretching to near Lake Kennedy were also extensive

Significant Wetlands of the Hamilton Region

The following pages illustrate many of the wetlands that were affected by settlement. Some of the waterbirds that may be seen now are also shown

The main wetlands that will be presented are:

- Buckley Swamp (The Great Swamp)
- Lake Linlithgow and adjacent swamps
- Bradys Swamp
- Gooseneck Swamp
- Lake Muirhead
- Mt William Swamp
- Bryans Swamp
- Condah Swamp
- Lake Condah

Buckley Swamp (The Great Swamp, *Ko.nung.i.yoke*) as described by Bruni (1903):

"*The most remarkable feature in the district around Hamilton is the great morass some miles to the south of the town.*

Photo 3 – **Wetlands in the area between Mt Napier and Mt Rouse**.
This includes drained areas subject to flooding seasonally.

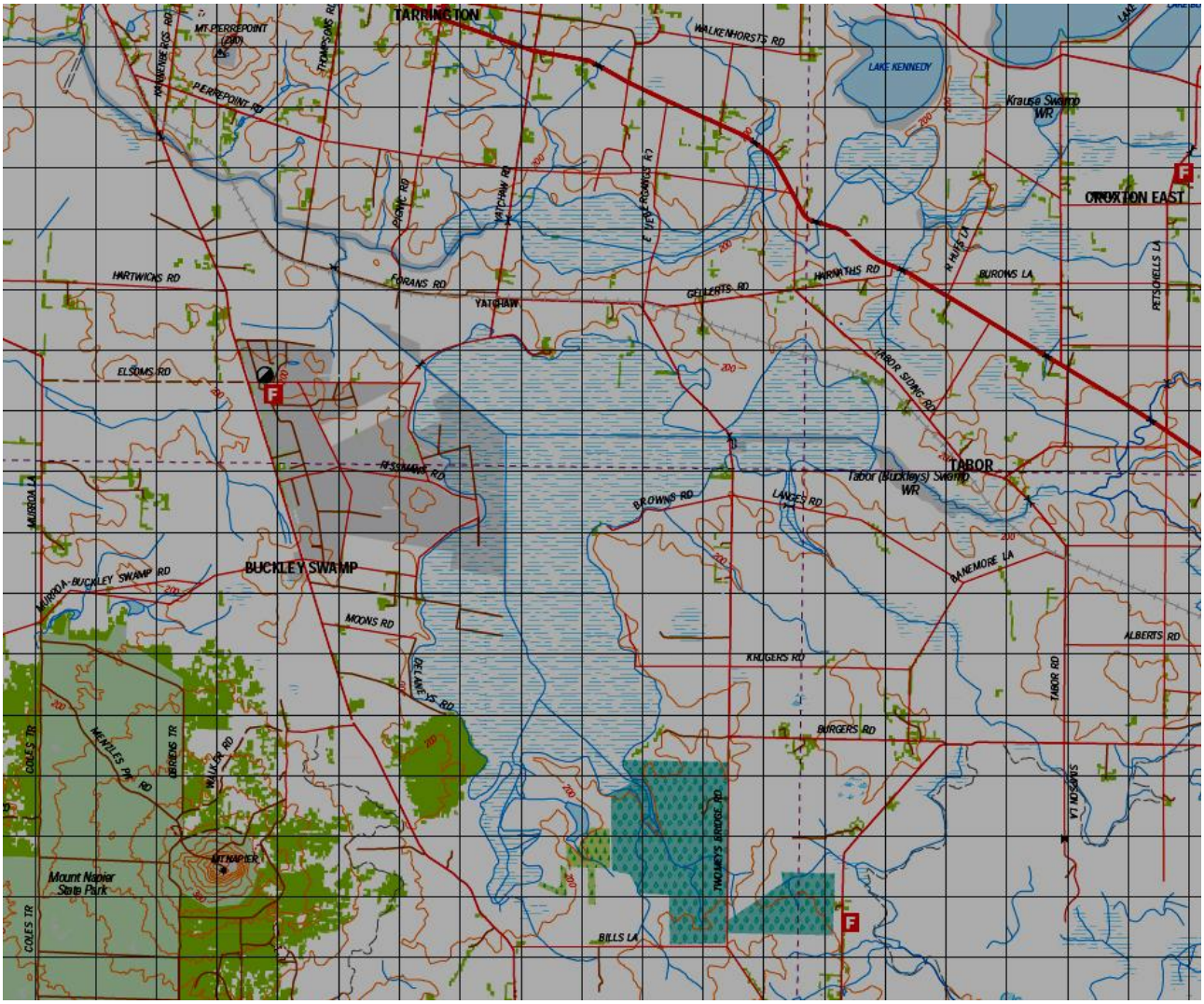


Photo 4 – L**ooking east over the drained Great Swamp in Aug. 2004 after 300 mm of rain in May-Aug**.

The area grazed by the cattle is flooded in a very wet year. The central N-S drain is visible and Mt Rouse can be seen in the distance (right, hand corner).

Buckley Swamp was formed when Mt Napier erupted some 30,000 years ago (Bennetts *et al*. 2003), blocking the Harmans Valley watercourse. Carbon dating of peat from the swamp gave a date of 7,300 years (Gill & Elmore 1973). The swamp had no stream outlet but in the 1880s a channel was dug through a hill to empty it into Muddy Creek, a tributory of the Grange Burn.

The wildlife of The Great Swamp – has been described by Bruni (1903), alias GA Brown (*see* Anon. 1993b):

"*The most remarkable feature in the district around Hamilton is the great morass some miles to the south of the town...thick border of reeds that fringed it round...it was the home of myriads of waterfowl...snipe were in countless numbers...a days shooting was then a very risky affair, for the edge of the morass was, I might almost say, carpeted with snakes of many varieties*" [Tiger, Copperhead, Brown and Red-bellied Black Snakes].

Photo 5 **– Latham's Snipe at Sandy Cove, Port Fairy 26 December 2013.**

This is a migratory species, flying to and from Japan each year, arriving in Australia in late Spring and leaving in early Autumn.

In 1888, after several uncoordinated efforts in the 1870s, farmers in the Buckley Swamp area had the Yatchaw Drainage Trust gazetted, on 2,428 ha of land (Anon. 1993a).

Photo 6 **– Map of Lake Linlithgow and adjacent wetlands**.

The swamp marked Krauses Swamp is actually Harnath Wildlife Reserve.

Krauses Swamp is adjacent to the north end of Bullrush Swamp.

The large swamps near the junction of Chatsworth Rd and H Mibus Rd and south of Lake Kennedy are ephemeral, probably drained.

Photo 7 – **Lake Linlithgow seen from the north, almost dry in January 2008.**

A 'cloud' of perhaps 5,000 Sharp-tailed Sandpipers is about to descend on the remaining surface water. When the water evaporates they move on to another feeding area.

This magnificent 1,000 ha lake is in a largely unaltered state and fluctuates from being full to empty over the decades (see Bird *et al.* 2008 for its water history).

Photo 8 – **Sharp-tailed Sandpipers feeding on the bed of Lake Linlithgow, January 2008**.

Sharp-tailed Sandpipers breed in Arctic Siberia and many migrate annually to Australia in summer, where they occupy coastal and inland mudflats and shallow wetlands.

Photo 9 **– Lake Linlithgow viewed from the bay at Chatsworth Rd, December 2000.**

The rare Salt Poa (*Poa sallacustris)* is seen in the foreground.

Photo 10 **–** ***Eutaxia microphylla*** **at Lake Linlithgow, December 2007.**

This colourful low shrub was not seen until grazing was removed from the foreshore.

Photo 11 **– Lake Linlithgow in 1967 when the entire foreshore was treated as a farm paddock**.

Grazing was removed from all parts of the reserve in 2003 and this has resulted in a recovery of some native tussock grasses and other plants. There is less bare ground and consequently a reduction in the mass of thistles that grow profusely on disturbed sites on these fertile, cracking soils.

Photo 12 **– Lake Linlithgow – Banded Stilts near The Point in December 2007**.

Banded Stilts prefer to dine on brine shrimps. They breed irregularly in large colonies (many thousands of birds) on small islands on inland salt lakes, when the lakes have water.

Photo 13 **– Lake Linlithgow – Black-winged Stilts and Whiskered Terns, December 2007.**

Photo 14 **– Pelicans on Lake Linlithgow, February 1992.**

The lake dries out periodically but small fish return, as evident by the presence of Pelicans.

Cape Barren Geese were seen at Boonawah Creek in the 1960s and 1970s but not since then.

Lake Linlithgow. Anon. (1882) 'Native companions and plover'. *The Western Agriculturalist*, 1 April.

"*There are myriads of ducks, hundreds of swan, geese, plover, pelicans and, during the morning and evening, native companions in great number. Unfortunately no shooter can get near enough to them to shoot...During the last few weeks farmers in the Lake Linlithgow district have been busily engaged in burning stubble, and the burnt fields are now the haunt on native companions and plover. These can be counted by the thousand and can easily be brought in range by the sportsman creeping up to the bank of the lake. As the much talked of turkeys are conspicuous by their absence, and native companions* [Brolga] *if properly bled, buried etc. are not bad eating, a profitable hour's sport can be obtained...in one flock of native companions...there could not have been fewer than a thousand birds*" (Anon. 1882).

Photo 15 – **Brolgas at Krauses Swamp, February 2008.**

Photo 16 **– Glossy Ibis at Krauses Swamp in November 2011, uncommon visitors.**

Photo 17 **– Australasian Bittern at Krauses Swamp on 31 July 2011 – an uncommon species.**

Photo 18 – **Bullrush Swamp in February 2002 frequented by Eurasian Coots, ducks and Black Swan.**

Photo 19 – **the saline Lake Kennedy in February 2007.**

As at Lake Linlithgow, John Harris from Parks Victoria had trees planted on the reserve from 2003-2008.

***Photo 20* – Bradys Swamp at the SE corner of the Grampians National Park in 1948.**

Bradys Swamp was once a magnificent wetland, filled by fresh water from the Wannon River, flowing out of the park from its alluvial fan. It was host to hundreds of Magpie Geese, Ibis, Brolga and other waterbirds.

The aerial photo shows the wetland system in 1948. The drain from Heifer Swamp (near the lower right corner of the photo) to Bradys Swamp was dug in about 1900 and the 900 acre Heifer Swamp was then subdivided and sold by the Lands Department (Anon. 1905; GHCMA 2002a). The Bunnugal Drainage Scheme was instituted in 1954. Lynchs Crossing Rd passes below Walkers Swamp and 1 km further west it turns north. Gooseneck Swamp is the dark area above Bradys Swamp.

***Photo 21* – the middle and North side of Bradys Swamp from North Boundary Rd, April 2011.**

***Photo 22* – part of 450 ha Bradys Swamp in Feb. 2011, after 250 mm of rain in Dec. 2010 & Jan. 2011**.

The swamp has a shallow E-W drain across the centre, installed after World War 2 (GHCMA 2002b) – probably after 1948 since it does not show in the 1948 photo – and is usually dry by January or February. About 253 ha (southern part) is freehold and 200 ha (northern part, pictured) lies within the Grampians/Gariwerd National Park. That part, and Gooseneck Swamp, was at one time freehold land. In 1986, that 232 ha area was purchased by the government and incorporated later into the park (Cerini 2013).

Landholders and government propose work in 2014 to moderate the effect of the Bradys Swamp drain.

***Photo 23* – Bradys Swamp, north side (SE corner of Grampians National Park), 16 April 2011.**

***Photo 24* – Gooseneck Swamp in the Grampians National Park, 25 February 2011, after the flood.**

It was drained in the 1950s when a landholder had a trench bulldozed through the lunette into Bradys Swamp, about 100 m to the south. The area covers at least 30 ha, merging into the Red Gum woodland.

***Photo 25* – Sandbagging the outlet drain from Gooseneck Swamp on 26 August 2013.**

The view is to Bradys Swamp. Nature Glenelg Trust staff and volunteers were engaged in the project.

Photo 26 **– Gooseneck Swamp with the sandbagging of the drain completed on 26 August 2013.**

Photo 27 **– Gooseneck Swamp from the eastern side looking to Mt Abrupt, September 2013.**

***Photo 28* – Lake Muirhead & Mount William Swamp.**

Some 635 ha of unfenced Crown Land remains in the centre of the 1900 ha Mt William Swamp but is not accessible to the public.

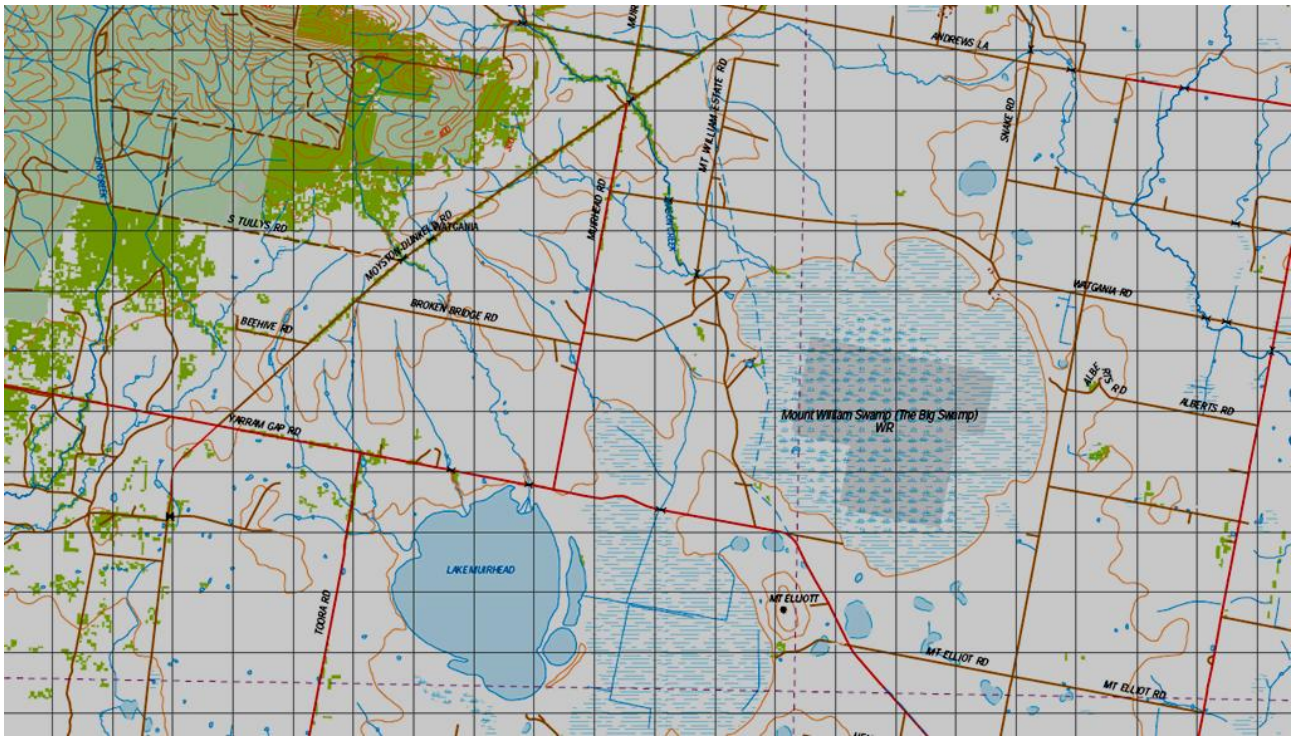


***Photo 29* – Mt William Swamp as it was in August 2011 – nearly full for the first time in 65 years**.

Most of the area has been alienated and sown to pasture (note the fence across the lake).

***Photo 30* – Mt William Swamp in August 2011 – HFNC excursion**.

This is on the eastern margin near the massive Sandhills Track lunette. It is unlikely that the swamp has permanently flooded this margin in the lifetime of these River Red Gums.

***Photo 31* – Lake Muirhead (280 ha) from Yarram Gap Rd, February 2011.**

***Photo 32* – Brolgas at Lake Muirhead from Yarram Gap Rd, April 2002.**

This wetland (Shallow Freshwater Marsh and Deep Freshwater Marsh) is a prime flocking site for Brolga in Victoria, with several hundred birds sometimes seen there.

At least parts of the lake dry out annually and the birds seek crickets and other insects on the flats. In summer and autumn Brolga spend much of their time in flocks on stubble areas in the Willaura area. Other small flocks are found near Penshurst where they fossick near wetlands on Blackwood and Penshurst.

Lake Muirhead is also prime habitat for rare species such as the Freckled Duck.

***Photo 33* – Lake Muirhead from the south side, looking north to Yarram Gap Rd, April 2002.**

The SW section has an area of flats that are subject to inundation. Parts are generally covered with reed and rushes while the rest is mud flats when not under water.

Photo 34 **– Painted Snipe in a seasonal wetland on Parrie-Yaloak Rd, 12 August 2011.**

The Painted Snipe is a rare species in Australia. It is not often seen in Victoria. In this instance a pair of birds were taking advantage of the habitat afforded by a crop that had been flooded in Janary before harvest.

Photo 35 **– Red-kneed Dotterel in a wetland on Parrie-Yaloak Rd, 12 August 2011.**

Red-kneed Dotterels – and Black-fronted Dotterels – are resident in Australia and may be found across the continent wherever suitable habitat is available.

Photo 36 – **Map of Bryans Swamp and Wannon River area**.

A drain runs through Bryans Swamp NE into Dwyers Creek. The swamp empties west into the Wannon.

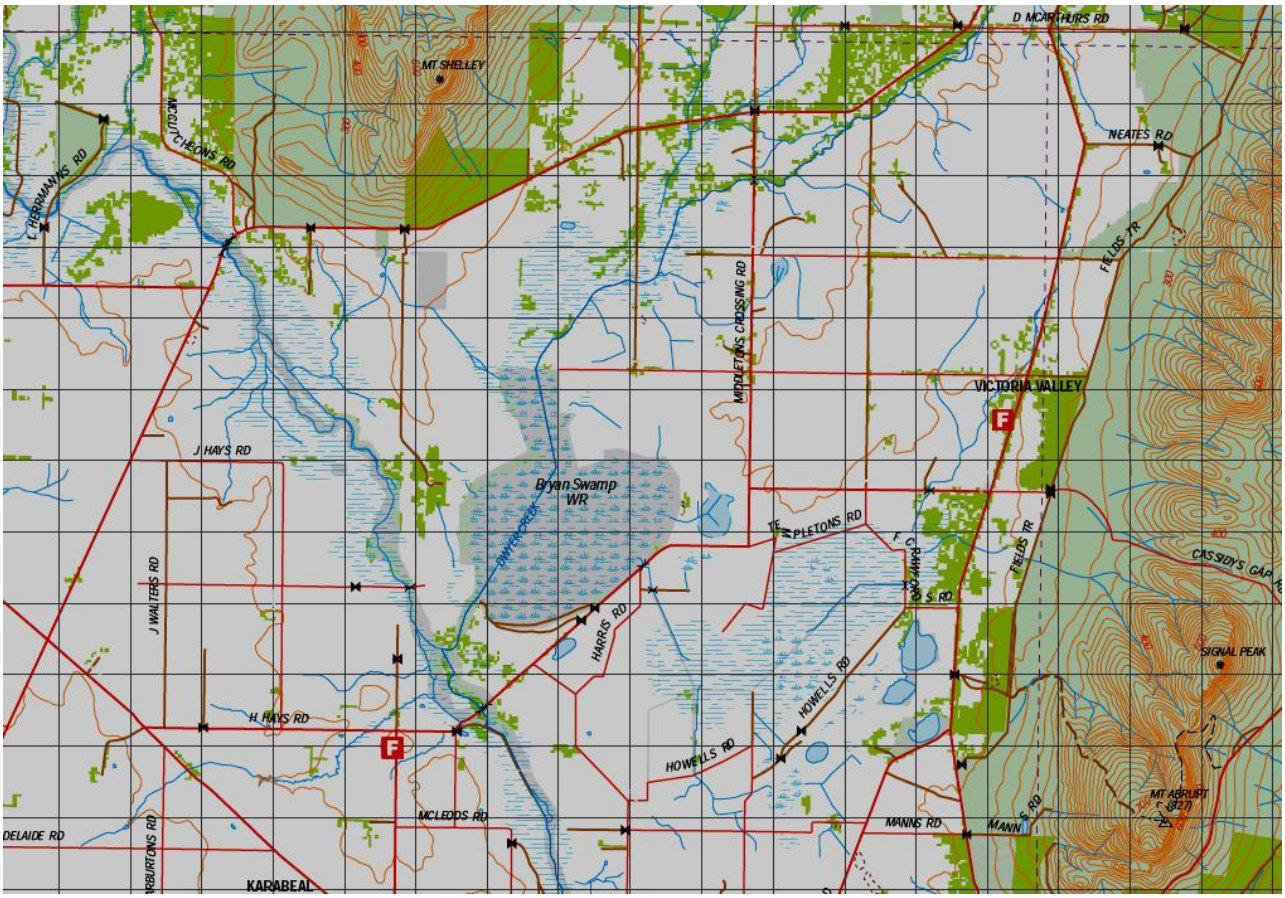


Photo 37 – **Bryans Swamp seen from the southern top of Victoria Range, September 1986**.

Mt Sturgeon and Mt Rouse are seen in the distance. Mahoneys Swamp (1900 ha catchment) and others that lie on the floodplain of the Wannon River between Bryans Swamp and Mt Sturgeon have all been drained.

Bryans Swamp (648 ha) had the outlet deepened in the early 1900s to drain the swamp. Work to restore the swamp in the 1980s was aborted due to concerns about drainage back into Mahoneys Swamp (see above).

***Photo 38* – The drain through Condah Swamp, from the Boundary Rd bridge, September 2013**.

Condah Swamp (3,000 ha) was a major casualty of drainage in the late 1800s to 1955.

***Photo 39* – Lake Condah (250 ha) at the Eel trap area on the northern side, November 2011.**

This magnificent lake has been at least partially restored in 2010 by installing a weir on the channel that drained it and the Condah Swamp. That proposal took 8 years to implement. The restoration is partial; much of the northern lake bed remains dry and the depth of water achieved is 1 m or more lower than before the Condah Drain was made. However, it is enough to enable some of the eel traps to function.

***Photo 40* – Lake Condah weir installation and fish ramp functioning, October 2010**.

The view is downstream along the drain, towards the Condah Mission and Darlots Creek.

Lake Condah was described in 1843 as '*a splendid freshwater lake...about a mile and a half long and three quarters of a mile wide and contains almost every variety of fish in abundance, with swans, ducks etc...*' (Anon. 1843).

This 250-ha lake was drained from 1886 to 1954. It supported the *Kerupgundidjmar* clans, who modified the landscape and used stone traps to harvest eels (Clark 1990). Heather Builth's studies showed that their society was based on eel culture (see Phillips 2003). In February 2002 the Lake Condah Sustainable Development Project was launched, to restore the lake and cultural connections. In July 2004, the Budj Bim National Heritage Landscape was the first listed in Australia. In March 2008 the lake was returned to the *Gundidtjmara* and plans, permits and funding for the weir had been obtained. The weir on the Condah Swamp drain was installed in autumn 2010 and the lake filled that winter to a level at least 1 m lower than before it was drained.

The Portland-Bessiebelle-Branxholme wetlands

The region between Portland and Hamilton abounded with swamps in the early days making travel an arduous process. Apart from the 3,000 ha Condah Swamp and the Bessiebelle and Gorrie Swamps (Honan 2008; Parliamentary Inquiry 2013) there were extensive wetlands around Branxholme and Hotspur.

Mitchell (1838) commented at length on the swamps and lakes encountered in 1836. Thus, some 20 km north of Portland "*swamps, entirely clear of timber, appeared in so many places that I could scarcely hope to get through*".

Boldrewood (1884) wrote of "*large marshes, with heathy flats and more thickly timbered forests*" at 'Squattleseamere', on the Eumeralla River, 16 km from Portland.

James Bonwick (1858) wrote: "*The Smokey* [Crawford] *River rises from the Branxholme swamps ……Great numbers of native companions, cranes, ducks and geese* [Magpie Geese] *frequent these swamps*".

Agricultural development and the loss of wetlands

Early pastoral settlement of the plains – the Squatting Era

Squatters appropriated the land for pastoral runs from 1837. They sought a permanent water hole for themselves and their livestock and built huts and yards there. Examples of such settlements are:

- Mt Sturgeon Station on the Wannon River near Dunkeld and Bryans Swamp
- Mokanger east of Cavendish on the Wannon River
- Kennilworth west of Cavendish on the Wannon River
- Murndal on the Wannon River west from the Wannon Falls
- Fulham on the Glenelg River north of Balmoral.

Robinson and others record that the Aborigine inhabitants, who required the same resources to live, were dispossessed and many were murdered. The settlers simply assumed the right to the land and the Aborigines had no legal rights and no redress. Their way of life for perhaps 60,000 years vanished in less than 6 years.

Photo 41 – **Kenilworth on the Dundas Tableland in 2010.**

This was one of the first stations established on the Wannon River. It overlooks a pool on the river downstream from Cavendish (GHCMA 2002c).

There was no great pressure to alter the landscape in the squatting era and little clearing of trees or drainage of swamps occurred.

All that changed after the 1850s when Gold seekers from America, Europe and China poured into Victoria. The population increased from 77,000 in 1851 to 540,000 in 1861 at the end of the gold rush when the alluvial gold had been garnered and deep mines were then needed to extract more gold.

Those who stayed had to find other means of support. Hundreds of thousands of new settlers joined the rush for land. The large runs held by the squatters had to be broken up to supply the demand.

The swamps were soon to be drained to get more fertile land.

Selectors and the first Land Acts

1860 Land Act – allowed selections of up to 260 ha. Squatters bought up strategic water areas and used "dummy" selectors to prevent their runs being broken up.

1869 Land Act – limited the selected area to 130 ha. After 1870, pastoral leases were no longer issued and land for settlement could be bought from the State (Austin & Bishop 1981). From 1860 to 1880, land under cultivation increased from 175,000 ha to 702,000 ha (Anon. 1981). The new legislation was the means of opening up land, including forests, which had not attracted squatters.

1884 Land Act – all the available "agricultural" land had already been alienated (Anon. 1976). Selectors then took up patches of land along valleys and swamps. Forest reserves from which timber had been cut could be cleared and other types of reserves were also revoked to allow selection. Between 1885 and 1900 about 3 million ha of Crown land was alienated for agriculture (Austin & Bishop 1981).

The Act prohibited alienation of swamps held by the Crown but the Government allowed many, including Koo-wee-rup, to be drained and free-holded. Buckley Swamp was also targeted and co-operatively drained by selectors who reclaimed up to 3,500 ha for farms in 1873-74 (Garden 1984).

Liver fluke & foot rot

These diseases of livestock led to drainage of the land. James Bonwick (1858) wrote of the property called Bassett, near Branxholme: "*The Smokey River rises from the Branxholme swamps…*The "*grassy undrained flats*" were "*the very hot-bed of disease. Fluke and footrot in wet seasons caused heavy losses... the drainage of the property was an enormous effort, a great portion was performed with the spade ...drains being a foot wide and 9 inches deep* (Anon. 1997c).

Soldier Settlement

Schemes were introduced after both wars; 'Kenilworth' and 'Moralla' in 1917 (GHCMA 2002c) and 'Squattleseamere' in 1924 but the biggest development occurred after WW2. Large estates on the basalt plains were forced to sell part of their properties to the State for the purpose of establishing Soldier Settlement farms.

After the war there was increased pressure to more effectively drain swamps, such as Lake Gorrie, Buckley Swamp, Condah Swamp and Heifer Swamp that were imperfectly drained in earlier times. Drainage Schemes such as Yatchaw, Strathdownie, Eumeralla (3,446 ha), Condah and Bunnugal were put in place from the 1940s.

Categories of Wetlands

Wetlands are naturally occurring depressions or floodplains covered temporarily or permanently by fresh, brackish or saline water, and they occupy 2% of the State (DNRE 1997).

Broad categories in the GHCMA region:

1. **Freshwater Meadows** – shallow depressions flooded for <4 months each year (most drained wetlands, such as Soldiers Swamp off Hamilton Highway and South Boundary Rd);
2. **Shallow Freshwater Marshes** – wetlands that dry out in mid-summer (e.g. Bryans Swamp);
3. **Deep Freshwater Marshes** – usually flooded throughout the year (e.g. Lake Linlithgow, Lake Bolac and part of Lake Muirhead)
4. **Permanent Open Freshwater** – wetlands and impoundment that do not usually dry out;
5. **Semi-permanent Saline Wetlands** – wetlands flooded for <8 months, incl. salt pans/salt meadows (e.g. Lake Kennedy);
6. **Permanent Saline Wetlands** – tidal areas or inland saline lakes that rarely dry out (e.g. Sandy Cove at Port Fairy).
7. **Sewerage ponds**

The Deep Freshwater Marshes dry out periodically. Lake Bolac was dry in 1843 (Clark 1988) and in most years from 2005 to 2010. Linlithgow dried out in 1843 (Clark 1988), 1882 (Anon. 1999a), and was dry (at least in summer) for many years from 1903-46 (Bird *et al*. 2008). Over the last 15 summers (Feb. 1999-Feb. 2013) this lake has been dry in 9 of those February records. The most water seen in February was 80 cm in 2011, following 126 mm of rain in late December 2010 and 125 mm in January 2011. For those 15 years the average water depth in February was 0.143 m (range 0-0.8 m). Contrast that with the previous run of 15-years (Feb. 1984 to Feb. 1998) when the average depth was 1.583 m (range 1.26-2.45 m), with no dry year.

Wetland statistics

Victoria – in total there are 635,000 ha of wetlands. Some 37% of Victoria's wetlands have been drained, 90% from private land (DNRE 1997). Of these wetlands, some 43% of Freshwater Meadows, 60% of Shallow Freshwater Marsh and 70% of Deep Freshwater Marshes have been drained.

Koo-wee-rup Swamp (40,000 ha), Buckleys Swamp, Condah Swamp and Strathdownie are among the large swamps that have been drained but substantial areas have been lost from a mass of smaller wetlands. Paradoxically, the total number of wetlands in Victoria and South Australia seems to have increased since settlement, an anomaly due to the fact that many clusters of small swamps were once absorbed in large swamps – the total area of wetlands has shrunk.

Western Victoria – 78% of the Shallow Freshwater Meadows and 66% of Deep Freshwater Marshes have been lost though drainage (DNRE 1997).

Volcanic plains – over 75% of the Shallow Freshwater Meadows and Marshes have been lost or severely modified by drainage works (DNRE 1997).

Wetlands in the GHCMA Region (2,600,000 ha):

- Total Number = 5,412 (~41% of Victoria's 13,000 wetlands >1 ha)
- Area = 73,188 ha (2.81% of region) – or 11.5% of the total wetland area in Victoria
- No. of wetlands <50 ha in area = 5,222 (96%) = 37,250 ha (51% of total area of wetlands)
- No. of wetlands 500-1,000 ha in area = 9 (0.17%) = 6,589 ha (9% of the region's wetland area)
- No. of wetlands >1,000 ha in area = 3 (0.05%) = 9,528 ha (13% of the region's wetland area)
- Privately owned wetlands cover 61% of the total area of wetlands
- 60% of the region's wetlands (mostly shallow freshwater wetlands) were drained for agricultural purposes between 1788 & 1994
- Artificial impoundments total 649 (5,800 ha), with Rocklands the largest at 2,600 ha.

Wetland sub-categories in the GHCMA:

- Freshwater Meadow 20,163 ha (28%)
- Shallow Freshwater Marsh, Herb 9,369 ha (13%)
- Shallow Freshwater Marsh, Sedge 2,217 ha (3%)
- Deep Freshwater Marsh, Open water 8,103 (11%)
- Deep Freshwater Marsh, Sedge 1,651 ha (2%)
- Deep Freshwater Marsh, Cane Grass 1,272 ha (2%)
- Permanent Open Freshwater, Shallow 6,908 ha (9%)
- Permanent Open Freshwater, Dead timber 3,686 ha (5%)
- Permanent Open Freshwater, Impoundment 5,810 ha (8%)
- Permanent Saline, Shallow 3,937 ha (5%)
- Semi-permanent Saline, Salt pan 3,287 ha (5%)

Sub-catchments in the Shire of Southern Grampians (681,000 ha):

There is no neat alignment between Shire boundaries and GHCMA sub-catchments. Taking the following sub-catchments as approximately representing the Shire:

	Total Area (ha)	Private Area (ha)
G5 Glenelg River and Mathers Creek	1338	772
G6 Glenelg River – Grampians Headwaters	7584	110
G12 Bryan Creek	194	190
G10 Wannon River – Dwyers Ck to Wannon Falls	2757	1837
G11 Wannon River – Grampians Headwaters	3128	2725
G9 Lower Wannon River	717	332
G13 Grange Burn	2290	877
	18,000	6,843 (38%)

The wetlands comprise 2.64% of the Shire and about 40% are on private land, subject to future loss.

Restoration of wetlands in south-west Victoria

The *Western Region Sustainable Water Strategy*(DSE 2011) failed to provide any remedies for a resolution of the problem of past and projected future wetland loss, despite acknowledging that the current deplorable situation will get worse, whether or not climate change is a factor. There is no mention of the option of aquiring and restoring significant drained wetlands. And no mention of the need to alter some drainage schemes if we are to retain functional wetlands and biodiversity in a drier future climate.

The *Victorian Waterway Management Strategy* (DEPI 2013) deals with a host of management issues but has very little to say about the restoration of wetlands that have been drained, or any program for such action (www.depi.vic.gov.au/_data/assets/pdf_file/0017/200375/VWMS_Part3.pdf).

Restoration of wetlands is the most urgent environmental need in the SW region but it is doubtful whether there is currently any intent of government to address the issue, at least in a way that will provide a substantial increase in the area of water bodies that can survive a drying climate.

Only in recent years have wetlands commanded serious attention by CMAs. The GHCMA has had a Wetland Tender process (a 4-year term) that encourages landholders to maintain their wetlands but that does little to address the bigger picture of wetland restoration on the scale required. However, the GHCMA has recently adopted a formal strategy to '*establish a management framework for reinstating drained wetlands*' and to '*identify opportunities for land purchase of priority wetlands*' (Glenelg Hopkins Regional Catchment Strategy 2013-2019). There is a long way to go before substantial progress will be made but at least the strategy is there and the mechanisms can be used.

Water restoration projects can be quite protracted, with permits needing to be obtained from many departments, and authorities and landholders needing to be consulted. The Lake Condah Restoration Project was instigated by the *Windamara Aboriginal Corporation* and carried out by the *Budj Bim Sustainable Development Partnership* from 2002 to 2010, when the weir was actually constructed. There were many hurdles to jump in this relatively modest project that has only partially restored the water levels to original levels on the 250 ha lake. A complicating factor there was past opposition from landholders in the Condah Swamp area upstream and the need to provide reassurance that the weir would not create problems for them.

The Federal Government has recently (2012) listed the Seasonal Herbaceous Wetlands on the Victorian Volcanic Plains as a threatened ecological community, under the *Federal Environment Protection and Biodiversity Conservation Act 1999*. These wetland communities should be protected but can it be done? The pressure to drain and crop or graze these small areas is very great. Any drying of the climate will make a cropping option more attractive. Penalties for breaching the EPBC Act are substantial but action appears to be taken only when major breaches occur and when support from the Victorian Government is forthcoming. .

Entrenched landholder attitudes, lack of environmental knowledge and consequent opposition to wetland restoration make it difficult to modify drainage systems and reinstate key wetlands. Submissions from the Eumeralla, Yatchaw and Strathdownie Drainage Schemes to the inquiry into rural drainage (Parliamentary Inquiry 2013) are telling. The spokesman for the Eumeralla Drainage Scheme objects to the '*red tape*' associated with native vegetation retention and threatened species protection affected by proposed drain management: '*no-one asked the biodiversity to move into the drains…it feels as if we are being punished for the habitat we have provided the biodiversity to adapt too'*. The fact that 2,750 ha of wetland environment was obliterated by the drainage scheme has been forgotten!

The spokesman for the Yatchaw Drainage Scheme stated '*the landholders are sometimes a bit resistant to bringing the CMA into the equation, they just want to get the drains cleared…the fear around it possibly becoming a sort of wetland and works not occurring…at one stage the CMA wanted to take over Yatchaw but there was enough political push back at that stage for council to maintain the actual drainage scheme'*.

In 1998 the Committees of Yatchaw and Strathdownie had the drainage areas excluded from the 1994 Catchment and Land Protection Act, so that there was no requirement for them to apply to the GHCMA for waterways approvals and the GHCMA could not declare any designated waterways within those areas.

Submissions, including from the Hamilton Field Naturalists Club (Bird 2012), to the 2013 Parliamentary Inquiry into Rural Drainage may be seen at www.parliament.vic.gov.au

The most effective option for restoration of wetlands is to dramatically increase the area of pristine wetlands and that can best be done by concentrating on a few very large drained wetlands. The same total area resulting from dozens of small areas would achieve much less, and would be uneconomic to acquire, fence and manage. It is also doubtful whether they would be viable if, as seems likely, global warming is not abated.

Prime candidates for restoration in the Hamilton region are Buckleys Swamp, Bryans Swamp, Bradys Swamp, Mount William Swamp and The Morass near Moyston. Without this there can be no return of Magpie Geese, Brolga, Ibis, Egrets, Spoonbills and other waterbirds in the numbers seen before the drainage.

While there were pressures in the late 1800s to develop swamps as potentially fertile land for agriculture, that motivation does not have the same weight today. We should not go on blindly accepting that a path taken over 100 years ago is valid today, when circumstances and opportunities have changed.

Past losses of vast wetlands, and projected future losses of shallow wetlands that remain, is the prime reason why we should concentrate on a few major wetland areas rather than wasting resources on very small areas:

- a wet year can significantly boost the available water storage in a large wetland, with water lasting over a number of subsequent drier years – that cannot occur with small, shallow wetlands
- large wetlands like Buckley Swamp have a greater number of catchment sub-categories and are thus likely to be much more biologically diverse
- large wetlands provide more waterbirds with greater opportunities to breed successfully
- large wetlands provide ducks and other waterbirds with a safer refuge from hunters
- large wetlands are sought by migratory waders that must feed from extensive areas of shallow water and mudflats.

Restoration of large wetlands could provide a significant economic benefit from tourism. Thus, the restoration of Buckley Swamp would create a tourism resource for waterbirds superior to that at Bool Lagoon in South Australia. Birdwatchers would be attracted to such an accessible, attractive area. It would also have significant appeal as part of the Volcanic Trail. Buckley Swamp was a major Aborigine camp area, meeting place and food source (Presland 1977a) and could be a major feature in the Budj Bim tourism venture.

If we accept the need to reduce atmospheric carbon emissions in order to avert the worst effects of climate change then one way is to radically increase carbon storage. The government's Direct Action Plan was for soil carbon storage to provide 60% of the C reduction needed to achieve the 2020 target. However, it is probable that less than 10% of that could be achieved in our Australian agricultural systems – and any small gain in soil C is promptly lost by subsequent cultivation. Alternatively, the restoration of wetlands appears to offer a cost-effective, realistic way of increasing the storage of soil C (Euliss *et al*. 2006; Bernal and Mitsch 2013). This is a form of low-input landuse for which the farmer could benefit from C-credits, increased wildlife and possible income from duck hunting groups. Government assistance is available for other environmental projects so why not this, which would have multiple benefits to the environment?

References

Anon. (1843) report in the *Portland Mercury*, 11 January.

Anon. (1882) 'Native companions and plover'. *The Western Agriculturalist*, 1 April.

Anon. (1905) Notes and Events. The Colac Herald (14 April).

Anon. (1976) 'Victoria at the time of settlement', Victorian Year Book No. 90, and 'Settlement of Victoria', Vic. Year Book No 95. Aust. Bureau of Statistics, Vic. Office (Publ. Govt. Printer).

Anon. (1981) 'Geography'. Vic. Year Book No. 95, Aust. Bureau of Statistics, Victoria Office.

Anon. (1986) 'Around Branxholme'. *Hamilton Spectator*, 26 November.

Anon. (1989) 'History was challenged in early "Spec" letter'. *Hamilton Spectator*, 20 July.

Anon. (1993a) 'Trust turned swamp into productive land'. *Hamilton Spectator*, 9 September.

Anon. (1993b) 'The Buckley Swamp Bunyip'. *Hamilton Spectator*, 14 September.

Anon. (1997c) 'Bassett, Branxholme'. *Hamilton Spectator*, 11 December.

Anon. (1999a) 'Lake Linlithgow'. *Hamilton Spectator*, 18 February.

Austin C and Bishop H (1981) 'Grazing in the Victorian environment'. *Victorian Year Book* No. 95, Aust. Bureau of Statistics, Vic. Office (Publ. Govt. Printer).

Bennetts DA, Webb JA, Gray CM (2003) 'Distribution of plio-Pleistocene basalts and regolith around Hamilton, western Victoria, and their relationship to groundwater recharge and discharge'. *In* Advances in Regolith (ed. IC Roach), pp. 11-15 CRC LEME.

Bernal B, Mitsch WJ (2013) 'Carbon sequestration in two created riverine wetlands in the midwestern United States'. *Journal of Environmental Quality* **42**: 1236-1244.
Bird, Rod (2009) 'Targets for Wetland Restoration in GHCMA Region' (submission from Hamilton Field Naturalists Club) (see www.hamilton-field-naturalists-club-victoria.org.au)
Bird R (2011) 'The Hamilton region of south-western Victoria: an historical perspective of landscape, settlement and impacts on Aborigine inhabitants, flora and fauna'. (Publ. PR Bird, Hamilton, Vic 3300), 37 pp.
Bird PR (2012) Hamilton Field Naturalists Club submission: 'Parliamentary Inquiry into Rural Drainage in Victoria' to Environment and Natural Resources Committee, Parliament of Victoria (see www.parliament.vic.gov.au or www.hamilton-field-naturalists-club-victoria.org.au).
Bird Rod, Steve Clark, Murray Gunn (2011) 'History, fauna and flora of Lake Linlithgow (Jenawarra) and associated wetlands in south-west Victoria'. (Publ. PR Bird, Hamilton, Vic 3300), 56 pp.
Boldrewood R (1884) 'Old Melbourne Memories' (ed. CE Sayers). (Publ. 1969, William Heinemann).
Bonwick J (1858) 'Western Victoria; its geography, geology and social condition' (ed. CE Sayers). (Publ. 1970 by William Heinemann).
Bruni (1903) 'The Hamilton District'. *The Australasian*, 25 April.
Bride TF (1897) 'Charles Wedge'. p. 83 *In* 'Letters from Victorian Pioneers – a series of papers on the early occupation of the colony, the Aborigines, *etc.*, from Vic. Pioneers to his Excellency Charles Joseph Latrobe, Lt. Governor of the Colony of Victoria [TF Bride's collection, ed. by CE Sayers, 1983]. (Publ. Lloyd O'Neil).
Cerini, Gavin (2013) Wetland Management & Consultation Summary – Brady Swamp complex.
Clark ID (1988)(ed.) 'The Port Phillip Journals of George Augustus Robertson': 8 March-7 April 1842 and 18 March-29 April 1943'. Monash Publications in Geography No. 34. (Publ. Monash Univ.).
Clark ID (1990) 'People of the lake – the story of the Condah mission'. (Koori Tourism Unit, Victoria).
Conley DN (`1986) 'Patterns of agriculture'. *In* The Western Plains – a natural and social history'. (eds. D Conley & C Dennis). Publ. Australian Institute of Agricultural Science, Victoria.
DEPI (2013) *Victorian Waterway Management Strategy* (www.depi.vic.gov.au/_data/assets/pdf_file/0017/200375/VWMS_Part3.pdf).
DSE (2011) *Western Region Sustainable Water Strategy*. Publ. Victorian Government Department of Sustainability and Environment, Melbourne.
Douglas MH, O'Brien L (1971)(eds) 'The journal of Granville William Chetwynd Stapylton from 10 Jul-6 Oct 1836' – *In* 'The Natural History of Western Victoria'. (Publ. AIAS).
Euliss NH, Gleason RA, Olness A, McDougal RL, Murkin HR, Robarts RD, Bourbonniere RA, Warner BG (2006).North American prairie wetlands are important nonforested land-based carbon storage sites. *Science of the Total Environment* **361**, 179-188.
Gill ED and Elmore LK (1973) 'Radiocarbon dating of Mount Napier eruption, Western Victoria, Australia'. *The Victorian Naturalist* 90, 304.
Glenelg Hopkins Catchment Management Authority – *Glenelg Hopkins Regional Catchment Strategy (2013-2019).*
Glenelg Hopkins Catchment Management Authority – *Glenelg Hopkins Waterway Strategy 2014-2022.*
GHCMA (2002a) 'Whisperings of the Wannon' – story by Peter Dark (Publ. Glenelg Hopkins CMA).
GHCMA (2002b) 'Whisperings of the Wannon' – story by Fergus Kearns (Publ. Glenelg Hopkins CMA).
GHCMA (2002c) 'Whisperings of the Wannon' – story by Alan Brumley (Publ. Glenelg Hopkins CMA).
Honan J (2008) 'Yambuk Lake Yambuk people: Stories of Yambuk & catchments of Eumeralla & Shaw Rivers'.
Mitchell TL (1838) 'Three expeditions into the interior of eastern Australia'. (Publ. T&W Boone, London)
Phillips G (2003) 'Villagers, not nomads'. *The West Australian*, Weekend Extra, 24 May, p.3.
Parliament of Victoria (2013) *Inquiry into Rural Drainage.* Environment and Natural Resources Committee, Parliamentary Paper No.238 (Vic Government Printer).
Presland G (1980)(ed.) 'Journals of GA Robinson, May to August 1841'. *Records of the Victorian Archaeological Survey* No. 11. (Ministry for Conservation Publication).
Presland G (1977a)(ed.) 'Journals of GA Robinson, March-May 1841'. *Records of the Victorian Archaeological Survey* No. 6. (Ministry for Conservation Publication).
Presland G (1977b)(ed) 'Journals of GA Robinson, Jan-March 1840'. *Records of the Victorian Archaeological Survey* No. 5. (Ministry for Conservation Publication).
Tyers CJ (1840) 'Report of an expedition to ascertain the position of the 141st degree of east longitude being the boundary line between New South Wales & South Australia'. 1976 ed. (Publ. Queensberry Hill Press, Vic.).
Wallace B (2013) 'More of Hamilton and the 'Civil Establishment' of 1851'. Hamilton Spectator, 2 July.