

Case study: Managing cattle & wetlands where three rivers meet on the Calliungal floodplain

A broad floodplain generous with fodder, wetlands and wildlife occurs where the Dee River, Don River and Callide Creek meet south of Wowan, in the Dawson catchment, central Queensland, Australia. Since the mid-19th century, landholders on Calliungal station have operated a beef cattle enterprise here, while negotiating the impacts of many floods, some devastating. This case study illustrates how Calliungal's managers have tackled the challenges of floodplain grazing and applied recent technological innovations to achieve sustainable production—while retaining healthy wetlands and biodiversity. It provides information useful to landholders on land subject to major floods, in Queensland.

Calliungal cattle station (Dee-Don-Callide floodplain)

- 39 km south-south-west of Mt Morgan
- 10,500 hectares (26,000 acres)
- a cattle growing & fattening business

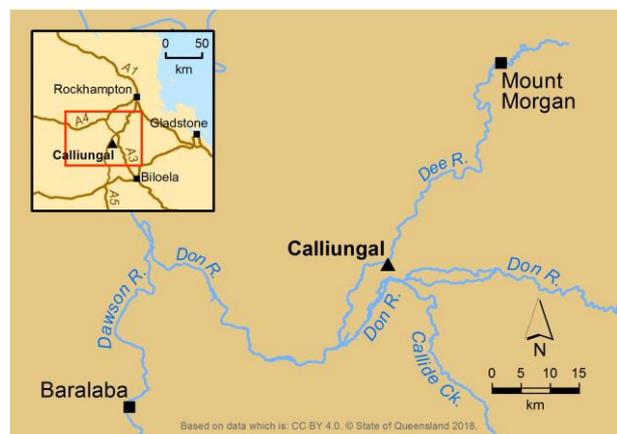
Place, past & people

Between Wowan and Goovigen in Banana Shire, Central Queensland, lies a distinctive landscape feature of the Fitzroy Basin. Three rivers—the Dee and Don Rivers and Callide Creek—converge, sometimes with dramatic consequences, on a three-pronged floodplain. The Dee-Don-Callide floodplain is approximately 37 km long, up to five km wide, and about 16,000 ha in area. Complex patterns of water flow ensure that it is rich in wetland features: channels, waterholes, ponds and swamps.

This system has been highly productive for cattle-raising for over 150 years. Soon after the country around Rockhampton was first developed for agriculture by the Archer brothers and others, a vast run known as 'Calliungal' was established from near Mount Morgan south towards Baralaba. The Wilson



A riverine wetland on Calliungal, with floating native plants.



Location of Calliungal station.

family was involved in the original European ownership and fourth-generation member, Will Wilson, is an owner of Calliungal through Calliope Cattle Company.

Today, Calliungal is much smaller, covering 10,500 hectares (26,000 acres), mostly on the Dee-Don-Callide floodplain. Calliungal homestead dates back at least to 1903 and has escaped being inundated despite floodwater almost reaching the floorboards in 1928. It sits on the levee bank of 'Double Creek', a channel that links the Dee and Don Rivers and can flow in either direction, depending on which river is in flood.

Mark Collins has a half-century association with Calliungal. His father was manager for 25 years and Mark has taken on that role for the past 26 years.



Left: Will Wilson (photo: Rural Weekly); Right: Mark Collins.



Hereford-Brahman cross-bred cattle on Calliungal.

Mark says that Calliungal is “the best natural grazing property I’ve ever known due to its carrying capacity and what [the floodplain] can do”.

Production overview

Calliungal runs a cattle growing and fattening operation. A focus on cattle breeding would be unrealistic here given the high risk of valuable breeders and calves being washed away in big floods. The animals are Hereford cross-bred with Brahman and more recently with Droughtmaster that have been introduced to increase growth rates.

Typically, around 4000 to 5000 head are grazed on Calliungal at any one time, according to conditions, such as reduced stocking rates during droughts. Mark’s goal is

“to grow the floodplain cattle to market specifications as best and quickly as possible”.

Most cattle are sold to meatworks. Some are sold to feedlots, which has the benefit of allowing greater spelling of pastures.

The western arm of the floodplain, downstream of Double Creek to Rannes and mostly between the Dee and Don Rivers, has light clay soil that supports extensive cover of native water couch. Queensland bluegrass and introduced urochloa dominate in slightly drier parts and the numerous, tree-less wet meadows of couch also support native *Eleocharis* spike-rush.

Modest amounts of direct rainfall over the western arm can soon produce useful cattle fodder there. Overall, this arm is the best cattle-growing country.

The eastern arms have heavier, deeper-cracking grey clay that requires more rainfall or a moderate flood to generate cattle fodder—and less grass cover is the norm here. This reflects the characteristics of country where the various tributaries of Callide Creek originate and where they enter the river system.

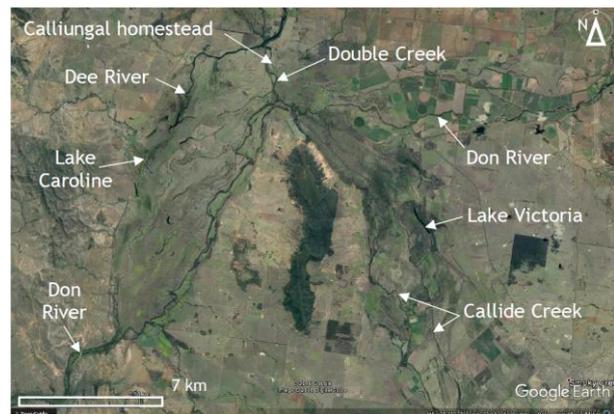
In flood years and very wet years at Calliungal, stock are kept off wetter parts of the floodplain for several

months, especially if fences need extensive repairs due to flood damage. This arrangement reduces pugging and allows wetland plants to complete their annual cycles, setting seed for the next year.

In drier years, ground cover is optimised by rotating stock around large paddocks (each in the order of 2000 acres) in the western arm downstream of the homestead. The resulting preserved ground cover, including in the wetlands, limits soil erosion when floods return. Selling cattle to feedlots also helps reduce grazing pressure in drier years.

The diverse and extensive cover of native vegetation—especially water lilies and other floating plants—visible in many of Calliungal’s shallow wetlands is testament to an ecologically sustainable regime of grazing.

Calliungal’s managers have undertaken the Grazing Best Management Practice initiative, further demonstrating their commitment to sustainability.



Satellite image of the Dee-Don-Callide floodplain at Calliungal station (Google Earth).

Managing the impacts of floods

Major floods are a constant concern during the wet season at Calliungal and historically the station has experienced some huge losses of cattle.

In 1928, about 2000 head of Calliungal cattle were drowned or lost:

“The animals went down in hordes. On all sides along the course of the river the beasts were tossed and swirled, some being caught in the branches of trees and others going downstream to be drowned and thrown on the banks for miles down.”

And “the sight of cattle suspended in trees 20 to 30 feet from the ground was sufficient evidence that the losses sustained by stock being swept away are very heavy.”¹

Mark Collins recalls that in one such flood, a dead bullock from Calliungal washed up in Rockhampton;

¹ The Morning Bulletin, Rockhampton, 1 May 1928.



Calliungal homestead, on the bank of Double Creek.

another was reported from Great Keppel Island, more than 400 km from Calliungal!

In 2003, around 3000 head of cattle were swept downstream to Rannes, of which 500 died or were lost. The flood in 2013 after rain from ex-cyclone Oswald—which dropped over 800 mm in the headwaters of Calliungal floodplain in just a few days—was the largest Mark has ever witnessed. Stock were washed over fences in a paddock that normally is a safe haven.

Short notice is the main problem. Following heavy rains in the catchments of one or more—often all—of the three rivers, water can quickly reach Calliungal and be up to two metres deep across much of the floodplain. There are only about eight hours of warning before Dee or Don water reaches the floodplain and flood peaks may last for several days. Callide water typically arrives 36 hours later, often as a second peak.

Accordingly, Mark and his team must be ready to call in two helicopters at short notice—provided daylight allows—to muster stock off the floodplain. It takes four to five hours to move the cattle to drier paddocks.

Mark says that he must:

“watch every few hours when a [major] rain event is happening”

and he makes preparations to move stock off the floodplain even if there are some false alarms.



Preventing loss of cattle due to flash floods is a constant concern for the Calliungal manager during the wet season.

Calliungal has always had some dry ground but not always convenient to where floodwaters are rising. Dee River floods push cattle, and anything else that floats, to the opposite (Don) side of the western floodplain whereas a target area for holding cattle safely is in the opposite direction, between the Dee and the railway.

To broaden the range of options available, Calliungal’s owners have purchased additional dry country—about 3000 acres in recent years—adjoining the floodplain.

Getting stock clear of floodwaters is a make or break issue at Calliungal and Mark cautions:

“If the manager does not know how to use the Calliungal floodplain, the cattle business would soon be wiped out”.

Major floods also cause great damage to fencing on the floodplain. Fencing losses due to five major floods over the past eight years ranged from 50 to 150 km per flood and a total of 550 km was lost. Replacement of metal-post fencing typically costs in the order of \$8000 per km; the actual cost is less because many pickets and much wire can be re-used. Accordingly, only the essential fences are replaced and maintained.



An often-repaired fence on the Calliungal floodplain.

Due to recurring fence losses, Calliungal does not have the option of adding more fences to run stock for shorter periods in smaller paddocks. However, its large size and persistent good pastures—especially between the Dee and Don Rivers—usually provide sufficient feed to keep grazing pressure at a sustainable level. This enables retention of good ground cover.

Normally the Dee River forms several kilometres of the Calliungal boundary but, in successive years of drought, that barrier is lost and temporary stock fencing must be erected between the two persistent waterholes.

Managing weeds

Being on a floodplain and thus an open system, Calliungal is vulnerable to weeds being washed in from upstream areas. A little parthenium has recently arrived and mat-forming (pasture-excluding) Indian couch is another threat. Invasive bushes such as prickly Acacia and parkinsonia are scarce or absent on

Calliungal, partly due to vigilance by the managers, applying chemical treatment (cutting the base and painting it on) before the shrubs become widespread.

However, infestations of mimosa bush² are increasing. As the plant spreads and grows rapidly, forming thorny thickets, it can disrupt stock movements. It does not seem to be a serious threat to pasture cover at present. It is not a prohibited or restricted invasive plant under the Biosecurity Act 2014.



Mimosa bush on Calliungal, June 2017.

Lake Caroline on the Dee River on Calliungal is at times totally covered in the floating salvinia plant. This prevents oxygen exchange and thus degrades water quality and reduces fish populations; native plants and waterbirds also decline. Salvinia is listed as a Weed of National Significance and has been designated a Prohibited Invasive Plant by Biosecurity Queensland.³

After the weed appeared seven years ago, Mark Collins introduced the recommended control weevil to the salvinia population, which had some effect. Floods (e.g. January 2015) removed some of the weed but it quickly returned, especially in warmer months. Persistence in treatment may be the best strategy.



Salvinia re-established on Lake Caroline, September 2015.

² https://www.daf.qld.gov.au/_data/assets/pdf_file/0007/74167/IPA-Mimosa-Bush-PP35.pdf

³ https://www.daf.qld.gov.au/_data/assets/pdf_file/0003/65964/IPA-Salvinia-PP12.pdf

Managing erosion

Siltation of waterholes and other wetlands on floodplain country, reducing water depth and quality, is an ongoing issue throughout the Fitzroy Basin. It is difficult to measure change due to scarcity of pre-European baseline data. Floods can also scour out channel sediment. On the floodplain at Calliungal, Mark is keen to maintain sufficient ground cover to prevent or minimise soil erosion.

Much timber has been retained along channels on Calliungal and in unfenced road reserves that traverse the floodplain close to the channels. These trees give stability to channel banks, thereby reducing the erosion that would occur if those banks were unprotected. The trees also provide extensive habitat for wildlife, including holes in mature trees where waterbirds such as pygmy-geese and wood ducks can nest.

At times the taller tussock grassland on the floodplain becomes thick and unpalatable to stock. Mark uses fire—when conditions allow—to revitalise pasture.

Innovative interventions

In 2017, the owner introduced remote-controlled, unmanned aerial vehicles (drones) as a tool for property management, with great effect.

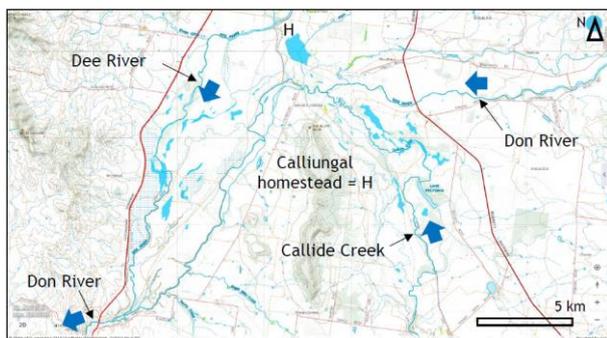
Using one drone and a motor vehicle (as base), 1500 head of cattle have been mustered by three workers in about two hours. An R22 helicopter would need to be hired for three hours, each time costing all up around \$1500 plus fuel, to achieve the same result (compared to the one-off drone purchase at around \$2000). However, mustering by drone is practical only in smaller paddocks for moderate-sized herds, where the stock are relatively well-contained.

Drones also enable the manager to examine parts of the property that may be difficult to access due to river channels or dense vegetation. The overall savings in time and money from applying this relatively new technology can be invested in other aspects of property management.



Drone used for cattle work and reconnaissance at Calliungal

Hydrology & wetlands



Rivers, other wetlands and water flow (all in blue) on the Calliungal floodplain; highways in red (Queensland Globe).

Knowledge of channel flood heights and inundation sequences at Calliungal is vital to Mark as manager of this floodplain property. From many years of observation, he has learnt the patterns of water dispersal on to grassy flats through minor channels and gutters and has concluded:

“We don’t want floodwater above the height of the main channels. Up to that level, it does all the good that it needs to do [for pasture].”

The three rivers that converge at Calliungal have markedly different flow characteristics. The Dee River, originating near Mount Morgan, flows inside the north-west edge of the floodplain, fills several long waterholes, then spills out into broad swamps (wet meadows and sedgeland) as its channel comes to an end. The Don River enters the north-eastern side of the floodplain and follows a well-defined channel that takes combined floodwaters beyond the floodplain to meet the Dawson River.

Despite its name, Callide Creek can contribute greater inflows to the floodplain than the Dee or Don Rivers, owing to its larger catchment, some parts of which are on the high-rainfall Kroombit Tops. Entering the south-eastern end of the floodplain, the Callide breaks into multiple channels before meeting the Don River.

As both the Dee and Callide are not totally confined to a single deep channel, this means that much of the



Lake Victoria: permanent wetland at the edge of Calliungal.

Calliungal floodplain is frequently and extensively inundated. This is highly beneficial to growth of pasture and thus to the cattle business.

Many of the riverine wetlands on Calliungal are permanent; Mark Collins has not seen them dry out, although some have gone close. Lake Caroline at the Dee River terminus on Calliungal and Lake Victoria on Callide Creek, are each up to two km long and up to 120 m wide.

Two local creeks also play important roles. Alma Creek and Boundary Creek can contribute usefully to pasture growth on the northern and western sides of the floodplain, respectively, without flow in the rivers.

Sustaining wetland biodiversity

Along the channels and in some of the shallower wetlands, the dominant trees are tall forest red gums, coolibahs and/or Moreton Bay ash, some of massive size and great age. Understorey native trees like white cedars, bauhinias and figs provide habitat for birds and animals requiring thicker shelter.



Spike-rush beds in the marsh next to Calliungal homestead.



Azolla and *Ottelia* in the margins of a Calliungal swamp.

Grass-sedge-forb swamps (marshes) are common at Calliungal, especially in the central part of the western floodplain between channels, and come in many forms and sizes. The largest such swamps of 100 to 200 ha, are dominated by beds of spike-rush within which a dense carpet of water couch grass appears when the swamps dry out.



Nardoo in shallows of a seasonal swamp on Calliungal.

Other typical native plants in swamps of this floodplain are aquatic ferns (*Azolla* and nardoo), water-lilies, lily-like marshworts and *Ottelia*, water primrose and spiny mudgrass (all of which form floating mats); also emergent sedges and thickets of budda pea. Swamps at each end of Lake Victoria comprise dense shrubs of lignum, a nesting habitat for ducks and other waterbirds; small areas of lignum occur elsewhere.

Relatively few surveys of waterbirds have been conducted on the Dee-Don-Callide floodplain, none comprehensive, although publicly accessible sites such as Lake Victoria have been visited by bird-watchers. At least 31 species of waterbird have been recorded, with largest numbers (around 500), mainly Grey Teal, on the Calliungal homestead marsh.

Cover of lilies and other floating plants at many of the Calliungal wetlands is sufficient to support Comb-crested Jacanas. Pairs and parties of the uncommon Cotton Pygmy-goose feed in the wetlands that have plenty of floating aquatic plants; they are present on multiple wetlands in small numbers and likely to use hollows in nearby old trees for nesting.

Mark Collins has seen up to 50 Brolgas on the plain and lone Black-necked Storks stalking fish in the shallows. White-bellied Sea-Eagles frequent water bodies such as Lake Victoria, and have at least one nest on the property, presumably finding adequate supply of fish.



Black swans and ducks in the Calliungal homestead marsh.

There have been no scientific studies on the fishes of Calliungal but local residents know that catfish, saratoga, perch and eels occur. Other wetland fauna include long- and short-necked turtles, freshwater mussels and crabs. Mark recalls a 3.0 m saltwater crocodile in a Calliungal waterhole about 25 years ago.

Conclusion

More than a century of careful grazing-land management on the Calliungal floodplain has demonstrated that landholders can have a productive enterprise together with good biodiversity values. In this floodplain landscape that can be swept by raging floods at short notice, specific strategies are required to mitigate the threats of stock and fence losses. Yet the very elements central to these challenges—abundant water and soil—can sustain high-value fodder and diverse wetland biodiversity if looked after wisely.

Acknowledgments

This case study was funded by the Queensland Government (Queensland Wetlands Program) through the Department of Agriculture & Fisheries and is supported by Fitzroy Basin Association Inc. through funding from the Australian Government.

The willing cooperation and generous assistance of landholders/managers Will Wilson and Mark Collins is gratefully acknowledged.

Staff of Fitzroy Basin Association and Dawson Catchment Coordinating Association provided timely administrative and logistical assistance and/or other advice and together with staff of the Queensland Wetlands Program (Department of Environment & Science; Department of Agriculture & Fisheries) contributed much appreciated review comments on drafts of the case study.

Photos are by the author, Roger Jaensch, unless otherwise indicated.

The Queensland Wetlands Program supports projects and activities that result in long-term benefits to the sustainable management, wise use and protection of wetlands in Queensland. Tools developed by the Program help wetlands landholders, managers and decision makers in government and industry. The Queensland Wetlands Program is currently funded by the Queensland Government.

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QWP/2018/07